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ABSTRACT

The study investigated the adoption behavior of 100 strawberry growers (including 32 Mennonites and 23 Japanese) in the lower Fraser Valley of British Columbia. Adoption of six selected practices was examined in relation to socioeconomic characteristics and ethnicity. Findings included the following: (1) ethnic groups differed significantly on educational background and 15 other socioeconomic factors as well as on adoption; (2) adoption averaged about 70%, with innovators and early adopters indicating 100% adoption for all innovations; (3) 74% of respondents with more than eight year of education, and 47% of those with less, were in the higher adoption categories; (4) situational factors were an important factor for both rejection and slow adoption; (5) participants in agricultural adult education courses tended to be innovators, early adopters, or early majority; (6) farm size and value, agricultural income, total income, and age (especially ages 20-34) correlated strongly with adoption. (Sixty tables and 29 references are included.) (LY)

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THE ADOPTION AND REJECTION OF INNOVATIONS BY STRAWBERRY GROWERS

THE UNIVERSITY OF BRITISH COLUMBIA

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THE ADOPTION AND REJECTION OF INNOVATIONS BY STRAWBERRY GROWERS IN THE LOWER FRASER VALLEY

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RURAL SOCIOLOGY MONOGRAPHS

#1 Adult Education and the Adoption of Innovations by Orchardists in the Okanagan Valley of British Columbia. By Coolie Verner and Frank W. Millerd, 1966.

#2 The Adoption or Rejection of Innovations by Dairy Farm Operators in the Lower Fraser Valley. By Coolie Verner and Peter M. Gubbels. Ottawa: Agricultural Economics Research Council of Canada, June, 1967. Publication #11.

#3 Adoption and Rejection of Innovations by Strawberry Growers in the Lower Fraser Valley. By E. Patrick Alleyne and Coolie Verner, 1969.

#4 Interpersonal Communication and the Adoption of Innovations. By E. Patrick Alleyne and Coolie Verner, 1969.

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E. Patrick Alleyne
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Vancouver
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TABLE OF CONTENTS

PAGE

ACKNOWLEDGEMENTS iii

LIST OF TABLES ix

CHAPTER ONE INTRODUCTION 1
- The Setting 2
- The Strawberry Industry 3
- Research Procedure 4
  - Sample 4
  - Data Collection 4
  - Data Analysis 5
- The Innovations 5

CHAPTER TWO CHARACTERISTICS OF THE SAMPLE 7
- Personal Characteristics 7
  - Age 7
  - Marital Status 8
  - Number of Children 8
  - Education 8
  - Education of the Wife 9
  - Agricultural Adult Education 9
  - General Adult Education 12
  - Years on Present Farm 12
  - Immigration 13
  - Farming Experience 13
  - Social Participation 13
  - Extension Contacts 14
- Economic Characteristics 15
  - Farm Operations 15

PAGE

Farm Size 15
Gross Agricultural Income 16
Tenure 17
Labour Employed for Harvesting 17
Farm Value 18
Ethnic Influences 18
Summary 22

CHAPTER THREE ADOPTER CATEGORIES AND THE ADOPTION OF INNOVATIONS 23
Characteristics of Adopter Categories 24
Classification of Respondents Into Adopter Categories 24
Relationship Between Adopter Category and Socio-Economic Characteristics 25
Age 27
Number of Children 27
Education 29
Education of the Wife 29
Agricultural Courses at Vocational School ... 29
Agricultural Adult Education 30
Attendance at Short Courses (L. M. H. I. A.) .. 30
Years of Farming Experience 31
Number of Years in Strawberry Growing 31
Number of Years on Present Farm 32
Ethnic Origin 32
Social Participation 32
Size of Farm 33
Acreage in Strawberries 33
Acreage in Other Agricultural Enterprises .. 33
Gross Total Sales from Agriculture 34

PAGE

Gross Sales from Strawberries 35

Gross Sales from Other Agricultural Enterprises 35

Amount of Time Spent in Off-Farm Work ... 36

Estimated Farm Value 36

Summary 37

CHAPTER FOUR ADOPTION BEHAVIOUR 38

Adoption and Non-Adoption 42

Progress Toward Adoption of the Innovations . 42

Innovation Response State 45

Reasons for Delay in the Adoption Process 50

Reasons for Rejection of the Innovations 55

Summary 59

CHAPTER FIVE SUMMARY AND CONCLUSIONS 61

Socio-Economic Characteristics 61

Ethnic Influences 64

Adoption and Non-Adoption of the Innovations 65

Reasons for Delay in the Adoption Process and for Rejection 66

Conclusions 67

BIBLIOGRAPHY 69

APPENDIX I DETAILED DISTRIBUTIONS BY ETHNIC ORIGIN 73

APPENDIX II DETAILED ANALYSIS OF THE INNOVATION RESPONSE STATES 87

APPENDIX III DETAILED DISTRIBUTIONS BY ADOPTER CATEGORY 91

LIST OF TABLES

PAGE

I Partial Correlation Coefficients 10-11

II Statistically Significant Chi-Square Values for Socio-Economic Characteristics by Ethnic Origin 20

III Classification of the Respondents Into Adopter Categories . 26

IV Statistically Significant Chi-Square Values for Socio-Economic Characteristics Against Two and Four Adopter Categories 28

V Percentage Distribution of Respondents at Each Stage in the Adoption Process by Innovation 43

VI Percentage Distribution of Respondents at Each Stage in the Adoption Process by Adopter Category 44

VII Percentage Distribution of Respondents by Innovation Response State for Each Innovation 46

VIII Percentage Distribution of Respondents by Innovation Response State and by Adopter Category 49

IX Percentage Frequency Distribution of Reasons for Delay in Proceeding Through the Adoption Process for All Innovations Combined 51

X Percentage Distribution of Reasons for Delay in the Adoption Process by Innovation 52

XI Percentage Distribution of Reasons for Delay in the Adoption Process by Adopter Category 53

XII Percentage Frequency Distribution of Reasons for Rejection of All Innovations 56

XIII Percentage Distribution of Reasons for Rejection by Innovation 57

XIV Percentage Distribution of Reasons for Rejection by Adopter Category 60

APPENDIX I

PAGE

XV Percentage Distribution of Ethnic Group by Agricultural Adult Education 74

XVI Percentage Distribution of Ethnic Group by Educational Level 74

XVII Percentage Distribution of Ethnic Group by Vocational Agricultural Education 75

XVIII Percentage Distribution of Ethnic Group by Educational Level of Wife 75

XIX Percentage Distribution of Ethnic Group by Years of Experience in Strawberry 76

XX Percentage Distribution of Ethnic Group by Years on Present Farm 76

XXI Percentage Distribution of Ethnic Group by Social Participation 77

XXII Percentage Distribution of Ethnic Group by Size of Farm .. 77

XXIII Percentage Distribution of Ethnic Group by Acreage in Strawberry 78

XXIV Percentage Distribution of Ethnic Group by Acreage in Other Agricultural Enterprises 78

XXV Percentage Distribution of Ethnic Group by Gross Total Agricultural Sales 79

XXVI Percentage Distribution of Ethnic Group by Gross Sales from Strawberry 79

XXVII Percentage Distribution of Ethnic Group by Gross Sales from Other Agricultural Enterprises 80

XXVIII Percentage Distribution of Ethnic Group by Tenure 80

XXIX Percentage Distribution of Ethnic Group by Extent of Off-Farm Work 81

PAGE

XXX Percentage Distribution of Ethnic Group by Estimated Farm Value 81

XXXI Percentage Distribution of Ethnic Group by Extent of Contact with the District Horticulturist Through Telephone 82

XXXII Percentage Distribution of Ethnic Group by Extent of Contact with the District Horticulturists Through Farm Visits 82

XXXIII Percentage Distribution of Ethnic Group by Extent of Contact with the District Horticulturist Through Mail . 83

XXXIV Percentage Distribution of Ethnic Group by Extent of Contact with the District Horticulturist Through Radio 83

XXXV Percentage Distribution of Ethnic Group by Extent of Contact with the District Horticulturist Through Newspaper Articles 84

XXXVI Percentage Distribution of Ethnic Group by Attendance at L.M.H.I.A. Short Course (1966) 84

XXXVII Percentage Distribution of Ethnic Group by Attendance at L.M.H.I.A. Short Course (1967) 85

APPENDIX II

XXXVIII Percentage Distribution of Respondents Unaware of the Innovation, By Adopter Category and By Innovation ... 88

XXXIX Percentage Distribution of Respondents Continuing the Adoption Process, By Adopter Category and By Innovation 88

XL Percentage Distribution of Respondents Who Had Adopted the Innovation, By Adopter Category and By Innovation 89

XLI Percentage Distribution of Respondents Who Had Rejected the Innovation, By Adopter Category and By Innovation 89

APPENDIX III

PAGE

XLII Percentage Distribution of Respondents by Adopter Category and By Age Group 92

XLIII Percentage Distribution of Respondents by Adopter Category and By Size of Family 92

XLIV Percentage Distribution of Respondents by Adopter Category and By Level of Education 93

XLV Percentage Distribution of Respondents by Adopter Category and By Educational Level of Wife 93

XLVI Percentage Distribution of Respondents by Adopter Category and By Agriculture Courses in High School 94

XLVII Percentage Distribution of Respondents by Adopter Category and By Agriculture Courses at Vocational School 94

XLVIII Percentage Distribution of Respondents by Adopter Category and By Number of Years of Farming Experience 95

XLIX Percentage Distribution of Respondents by Adopter Category and By Number of Years in Strawberry 95

L Percentage Distribution of Respondents by Adopter Category and By Number of Years on Present Farm 96

LI Percentage Distribution of Respondents by Adopter Category and By Ethnic Origin 96

LII Percentage Distribution of Respondents by Adopter Category and By Social Participation 97

LIII Percentage Distribution of Respondents by Adopter Category and By Size of Farm 97

LIV Percentage Distribution of Respondents by Adopter Category and By Acreage in Strawberry 98

LV Percentage Distribution of Respondents by Adopter Category and By Acreage in Other Agricultural Enterprises 98

PAGE

LVI Percentage Distribution of Respondents by Adopter Category and By Gross Total Sales from Agriculture 99

LVII Percentage Distribution of Respondents by Adopter Category and By Gross Sales from Strawberry 99

LVIII Percentage Distribution of Respondents by Adopter Category and By Gross Sales from Other Agricultural Enterprises .. 100

LIX Percentage Distribution of Respondents by Adopter Category and By Amount of Time Spent in Off-Farm Work 100

LX Percentage Distribution of Respondents by Adopter Category and By Estimated Farm Value 101

CHAPTER ONE

INTRODUCTION

The progressive modernization of the agricultural sector of the Canadian economy is reflected in an increasing capitalization and market orientation. The pace at which agricultural development follows progress in the industrial sector of the economy is governed to some extent by the rate at which the farmer accepts and uses technological innovations released by scientific discovery. Such acceptance of innovations will, in a large measure, determine the progress of agriculture, the level of agricultural income, and the relative socio-economic status of the farm family. In the main, the "modern" farmer in Canada is but a small proportion of the total number of farmers who operate generally small and uneconomic farm units.

The acceptance of agricultural innovations by farm operators is a complex process subject to variable influence by many factors and forces. Among such can be listed the personal characteristics of the farmer himself; his access to and use of various sources of information; his adoptive behaviour as measured by his response to an innovation; and the nature of the innovation itself. There is a slowly accummulating body of information leading to an understanding of the whole question of the adoption of innovations, nevertheless, there are particular aspects of the question that require further exploration.

The study reported here is concerned principally with the innovation response behaviour of a group of strawberry growers in the Lower Fraser Valley of British Columbia.[1] Particular attention is paid to the ethnic origin of the growers since this was an identifiable variable in the population studied.

THE SETTING

The Fraser Valley is a portion of the Lower Coast Area in British Columbia. It is about 20 miles wide and extends eastward some 100 miles from the Strait of Georgia. The valley is bound by the Coast Range on the north, the Cascade Mountains in the east and the International Boundary (49th Parallel) in the South. In general, the valley is flat to undulating with a few hills exceeding 1,000 feet.

The area is characterized by a marine climate with dry warm summers and humid mild winters. In January the mean temperature ranges from 32° F to 37° F with a mean range from 62° F to 65°F in July. The number of frost free days averages between 180 and 214 but this long period is off-set by cool summers which restricts the growing of heat-loving crops. Annual precipitation reflects the influence of the mountains with annual rainfall ranging from 36.3 inches on the coast to 64.4 inches against the mountains. Most of the rain occurs in the autumn and winter with summer rainfall rarely exceeding 13 inches during the period from May to September.

The lowland soils are predominantly recent silty, clayey flood plain, and deltaic deposits of the rivers. The higher portions of the valley are forest upland soils.

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[1] For a companion study of the same population see: E.P. Alleyne and Coolie Verner, Interpersonal Communications and the Adoption of Innovations. Vancouver: Department of Agricultural Economics, University of British Columbia, 1969.

Although the Fraser Valley is endowed with many favourable factors for agriculture, there are certain climatic and physical factors which necessitate definite management techniques such as high water tables and slow percolation which result in poor drainage. During the summer, many of the Gleysolic and higher textured Regosolic soils require supplemental irrigation.

THE STRAWBERRY INDUSTRY

The commercial production of strawberries in the Fraser Valley began before the first World War. At that time it tended to concentrate on the north side of the valley and was largely in the hands of Japanese farmers. At present, production is more widespread with the concentration primarily on the south side of the valley and there is now greater ethnic variation among the population of growers.

Data on crop acreages indicate considerable fluctuation over the years. Acreage increased from about 1,100 acres in 1920 to 1,800 acres in 1922, but declined to 1,400 acres by 1932. The highest acreage ever recorded was 3,170 acres in 1950 which declined to 1,350 acres in 1963. An estimated 1,650 acres were planted in strawberries in 1967. While a decline in the tonnage of berries produced usually followed a decrease in acreage, recently an increased productivity has been reflected in an increased tonnage despite a decline in acreage from 1960 to 1964. Comparing data for 1934 and 1964, there was a 35.8 per cent drop in acreage, but the tonnage increased by 33.0 per cent. Compared to an average yield of 1.5 tons of fruit per acre in the 1920's, today's average yield exceeds 3 tons per acre. The number of growers is declining but the average acreage is increasing.

In 1961, small fruit production in the Fraser Valley ranked third in crop product value and eighth among all crop and livestock products. The valley accounted for 73.3 per cent of the total production and for 75.2 per cent of the total cash income from all small fruits in the province. In recent years, strawberries have been the second most important small fruit crop after raspberries in both the valley and the province. British Columbia accounts for about one-third of both the total Canadian production of strawberries and of the processed crop. Berry producers in the valley face competition not only from other areas in Canada but also from the United States and Mexico.

RESEARCH PROCEDURE

The analytical survey method was used to conduct this study. The data were collected by personal interviews in the summer of 1967.[2]

Sample

The population for this study consisted of all the known commercial strawberry growers in the Fraser Valley of British Columbia. The initial identification of growers was made by using a list of those who applied for government assistance following the 1964 freeze-out of the strawberry crop. This list was revised through the assistance of Agricultural Extension Service personnel who were knowledgeable about the growers in the area. The final corrected list numbered 194 growers from which a 50 per cent sample was drawn plus a 20 per cent sample of alternates. Since the original sample totalled 97 growers this was increased to 100 by using the alternates to facilitate the use of percentages in the univariate distributions.

Data Collection

Interview schedules were prepared and pre-tested on growers not included in the survey sample. Personal interviews were conducted with the sample and seven respondents refused to be interviewed and sixteen could not be contacted. These farmers were replaced by names from the alternate sample. The interview schedule included data relating to personal characteristics of the growers, data on their farm operations, and their adoption behaviour. (Appendix III).

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[2] For a more detailed description of the study see: E. Patrick Alleyne, Interpersonal Communication and the Adoption of Innovations Among Strawberry Growers in the Lower Fraser Valley. Unpublished M.S.A. thesis, University of British Columbia, April, 1968.

Data Analysis

After the interviews were completed and the schedules edited, the data were key punched onto cards for processing on the I.B.M. 7040 computer at the University of British Columbia Computing Center. Statistical procedures used in analyzing the data included partial correlations and chi square. Tests of significance were made at the .05, .01, and .001 levels.

THE INNOVATIONS

The agricultural innovations selected for study had been recommended to growers over a period of five to seven years which insured a reasonable time for the farmers to pass through the adoption process for each innovation. Six innovations were selected:

1. picking carts--These are used at harvest time and allow a single picker to transport more fruit to the collection point with less damage. This is standard practice among growers in the United States and was first introduced to valley farmers about seven years ago.

2. matted row as a culture system infield layout--Although research results are inconclusive, there is evidence that matted row layout gives higher yields and tends to compensate for weak plants. This practice has been emphasized for 7 or 8 years in some areas although it has been known widely for more than 10 years.

3. spraying with Captan for fruit-rot control--Extensive spraying with Captan has shown a 50 to 100 per cent increase in sound fruit. This requires periodic applications at intervals of 7 to 10 days from first bloom to harvest. This practice was recommended to growers 7 to 8 years ago.

4. certified, virus-free plants--Research has shown that virus free plants possess superior vigor and produce higher yields and better fruit quality. This practice was first introduced about 20 years ago.

5. soil analysis for nemotode control--Nemotode damage to strawberry plants causes a reduction of plant vigor. Treatment usually lasts 3 to 4 years. This practice was introduced about 7 years ago and has received considerable emphasis during the past 5 years.

6. chemical weed control--Labour for weed control is a major expense in strawberry production. The use of chemicals for this purpose has been recommended for the past 10 years.

The degree of adoption of these six innovations constituted the principal dependent variable in the analysis of adoption behaviour. An adoption score was computed for each respondent in keeping with the tradition of adoption research.

CHAPTER TWO

CHARACTERISTICS OF THE SAMPLE

While there is some measure of agreement on the relationship between certain socio-economic characteristics and the adoption of innovations, the general situation remains indeterminate. It is necessary, therefore, to describe the particular population studied here in order to test the relationship of the characteristics studied to the adoption of innovations. The data were analyzed with particular reference to personal and economic characteristics, as well as ethnic influences.

PERSONAL CHARACTERISTICS

Age

As is typical of farm populations, the age distribution was skewed toward the upper ages. The median age group was between 45 and 54 years of age. Only 10 per cent of the respondents were below 35 years of age and one individual was in the 20 to 24 year category.[1] Thirty-six per cent were above 55 years of age, and 14 per cent were 65 years or more.

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[1] Since the sample consisted of 100 respondents, the whole numbers are also representative of the frequency percentages, except if otherwise indicated.

Partial correlation analysis (Table 1) indicates that older respondents had more children (r = .27), more farming experience (r = .38) and more experience in strawberry production (r = .28). They were among the earliest immigrants (r = -.46), and as would be expected, their wives had lower levels of formal education (r = -.26). Age correlated negatively with adoption, indicating that the older farmers generally exhibited lower levels of adoption.

Marital Status

Eighty-eight per cent of the respondents were married; 9 were single and 3 were widowed. This factor is not considered further.

Number of Children

The median category of 3 to 4 children included 36 per cent of the respondents. Similar proportions reported 1 or 2 children (24.0 per cent) and 5 or more children (26.0 per cent). Fourteen respondents reported no children. There was no relationship between the number of children and adoption.

Education

The median educational level of the sample was 5 to 8 years of school completed with 46 per cent of the respondents included in this category. Thirty-one per cent reported 9 to 11 years of formal education. Of the 16 per cent completing at least grade 12, five attended some university but only two received a university degree. Seven per cent of the respondents are classified as functional illiterates as they reported less than 5 years of schooling.

The better educated respondents had wives with higher educational attainment (r = .39), they had fewer years of experience in farming (r = -.29), and they participated to a greater extent in voluntary organizations (r = .31). Only seven per cent of the respondents reported having had vocational training in agriculture of whom five had taken agriculture in high school and two at university. There was no statistically significant relationship between educational level and the adoption of innovations.

Education of the Wife

Nine respondents were single and five respondents could not provide information about the educational level of their wife. Among those who did respond to this item, the median category of 9 to 11 years of school completed included 21 per cent of the wives. Nineteen per cent completed grade twelve. Four individuals had attended university but none of these received a degree. Five per cent were classified as functional illiterates. In general, the wives were better educated than their husbands. Those with higher levels of formal education were married to better educated operators who had larger, higher valued farms with higher gross sales of both strawberries and total agricultural products. The education of the spouse was positively correlated ($r = .48$) with participation in voluntary organizations. There was a statistically significant relationship between the education of the wife and adoption at the .05 level ($r = .24$).

Agricultural Adult Education

Fifty per cent of the respondents reported having taken adult education courses in agriculture. The Lower Mainland Horticultural Improvement Association[2] has been conducting annual two-day short courses which are of particular interest to small fruit producers for the past nine years. Forty-one per cent reported attending this course in 1966 but only 25 per cent attended both days. In 1967, 29 per cent attended the course with only 17 per cent attending on both days. Respondents were also asked if they attended a similar annual short course held in the State of Washington and ten per cent reported such attendance

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[2] Referred to hereafter as L.M.H.I.A.

TABLE

PARTIAL CORRELATION

	1	2	3	4	5	6	7	8
1. Adoption Score	1.00							
2. Age	-.31	1.00						
3. Number of Children	.15	.27	1.00					
4. Educational Level	.13	-.26	-.24	1.00				
5. Adult Education (Agr.)	.21	-.18	-.04	.15	1.00			
6. Adult Education (Gen.)	.14	-.16	.01	.15	-.20	1.00		
7. Wife's Education	.24	-.26	-.17	.39	.24	.15	1.00	
8. Years of farming	.04	.38	.25	-.29	.03	-.04	.06	1.00
9. Years in strawberry	-.02	.28	.06	-.15	-.03	-.08	.01	.53
10. Years on present farm	.01	.17	.09	.04	.08	-.02	.27	.51
11. Social Participation	.42	-.16	-.07	.31	.27	.10	.48	.21
12. Year of immigration	.02	-.46	-.02	-.09	.36	.02	-.09	-.45
13. Total acreage farmed	.35	-.19	.10	.24	.33	.12	.42	.19
14. Acres in strawberry	.52	-.21	.09	.17	.29	.09	.42	.09
15. Acres - other agriculture	.33	-.14	.09	.34	.38	.14	.49	.20
16. Gross sales - all agr.	.40	-.26	.02	.21	.38	.07	.47	.09
17. Gross Sales - strawberry	.46	-.13	.08	.26	.32	.15	.46	.14
18. Gross Sales - all other agr.	.49	-.23	.11	.21	.37	.02	.47	.12
19. Tenure	-.02	-.03	-.01	-.06	.10	-.03	.06	.08
20. Off-farm work	.13	-.17	.12	-.03	-.10	.27	-.21	-.22
21. Labour employed	.43	-.13	.10	.19	.31	.16	.31	.05
22. Farm Value	.32	-.19	.11	.20	.27	.13	.45	.21
	1	2	3	4	5	6	7	8

Note: The underlined values are significant at the .05 level.

1

COEFFICIENTS

9	10	11	12	13	14	15	16	17	18	19	20	21	22
1.00													
.45	1.00												
.01	.28	1.00											
-.49	-.59	-.32	1.00										
.09	.38	.56	-.03	1.00									
.04	.25	.47	-.06	.81	1.00								
.04	.40	.59	-.07	.94	.71	1.00							
.03	.24	.59	.06	.85	.79	.78	1.00						
.05	.25	.47	-.04	.78	.86	.69	.83	1.00					
.03	.27	.57	-.03	.78	.73	.75	.90	.66	1.00				
.06	.08	.12	-.07	.29	.29	.37	.36	.20	.38	1.00			
-.28	-.31	-.18	.24	-.27	.18	-.27	-.34	-.22	-.31	-.14	1.00		
.10	.22	.40	-.07	.75	.88	.71	.77	.85	.68	.26	-.16	1.00	
.12	.32	.55	-.10	.88	.77	.80	.86	.78	.80	.25	-.23	.74	1.00
9	10	11	12	13	14	15	16	17	18	19	20	21	22

in 1966 with 6 per cent reporting attendance in 1967.

Attendance at agricultural adult education courses and other activities such as meetings of the L.M.H.I.A., field days, and demonstrations was higher among those respondents with higher levels of social participation; who owned larger, higher valued farms with larger acreages in strawberries; and with other agricultural enterprises which gave them higher total gross income from the sale of farm products. Among the immigrant population (54 per cent), the most recent immigrants were more likely to have attended adult education courses in 1967.[3]

There was no statistically significant correlation between agricultural adult education courses attended in 1966 and adoption. Attendance at meetings of the L.M.H.I.A. ($r = .31$) and attendance at the 1967 two-day short course ($r = .36$) correlated positively with adoption. This is consistent with the importance of the recency and relevance of adult education suggested by Verner and Millerd.[4]

General Adult Education

Twenty-nine per cent of the respondents reported attendance in general adult education courses. A positive correlation ($r = .27$) indicates that respondents who spent a larger proportion of their time on off-farm jobs were most likely to have attended non-agricultural adult education courses.

Years on Present Farm

The median category of 10 to 19 years on the present farm included the largest number of the respondents (38 per cent). Thirty-seven per cent reported less than 10 years while 25 per cent reported 20 or more years on the present farm. The long established respondents had the greatest amount of both general farming experience (r = .51) and experience in strawberry cultivation (r = .45). They operated larger (r = .38) and more highly valued farms (r = .32), and were more likely to have diversified their agricultural enterprises (r = .40). Such operators spent less time on off-farm jobs (r = .31).

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[3] $r = .27$, $p < .05$

[4] Coolie Verner and Frank W. Millerd, Adult Education and the Adoption of Innovations by Orchardists in the Okanagan Valley of British Columbia. Department of Agricultural Economics, The University of British Columbia, Vancouver, B.C., 1966. (Rural Sociological Monograph No. 1).

Immigration

More than half (54 per cent) of the respondents were immigrants to Canada. An equal proportion come from eastern Europe and the Russian-Ukraine region, and 8 per cent emigrated from Japan. Most of the immigrants (31 per cent) arrived in Canada before 1945.

Farming Experience

The respondents were largely experienced farmers with 66 per cent having been in agriculture for 20 years or more but only 28 per cent had been growing strawberries for that period of time. Older farmers had both more general farming experience as well as more specific experience with a strawberry crop. The largest number of the operators (40 per cent) reported 10 to 19 years of experience with strawberries. Less than 10 years of agricultural experience was reported by 13 per cent of the respondents while 32 per cent reported the same experience with strawberry cultivation.

Educational level correlated negatively with both aspects of agricultural experience, but was only significant with reference to general farming experience (r = -.29). Operators who spent a considerable proportion of their time in off-farm jobs were also relative newcomers among strawberry growers (r = -.28).

Social Participation

Chapin's Social Participation Scale[5] was used to measure the degree of social participation. While church membership was excluded from the scale, membership in church-related organizations was included. The median scale score of 5 to 14 included 42 per cent of the respondents, thereby indicating an overall low level of social participation. Twenty-five respondents had a score of less than 5 and 16 per cent recorded zero; 17 per cent scored 25 or above. Among the several personal characteristics studied, social participation showed the highest positive correlation (r = .42) with adoption. The more highly educated respondents (r = .31) with better educated wives (r = .48) had higher levels of social participation.[6] Significant but lower positive correlations were also obtained with agricultural adult education (r = .27) and years on the present farm (r = .28).

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[5] F.S. Chapin, Social Participation Scale, (Minneapolis: University of Minnesota Press, 1938). The scale allows a score of 1 for membership in an organization, 2 for attendance, 3 for financial contribution, 4 for membership on a committee and 5 for holding office.

The variable social participation illustrates the definite block pattern of significant correlations which is evident in Table 1. High levels of social participation were characteristic of those respondents with large, high valued farms who received bigger gross agricultural incomes. Social participation was positively related to adoption and with attendance at the adult education short courses held by the L.M.H.I.A.

Extension Contacts

The level of extension contacts is exceptionally high among this sample in comparison to others studied in British Columbia.[7] More than half of the respondents reported contacts by telephone (63 per cent) or farm visits (56 per cent). Impersonal contacts by mail (82 per cent) and newspaper articles (64 per cent) were higher than for any personal contact type. The median number of contacts was 4 with an average of 3.4 contacts for the sample. Extension contact showed a significant positive correlation at the .01 level of significance with farm size and income, social participation, and adoption.[8]

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[6] A similar relationship has been observed by Coolie Verner and John S. Newberry, Jr. "The Nature of Adult Participation". Adult Education, 8:208-222, (Summer, 1958); and by C. Verner and P.M. Gubbels, The Adoption or Rejection of Innovations by Dairy Farm Operators in the Lower Fraser Valley. Ottawa: Agricultural Economics Research Council of Canada, 1967. (Publication No. 11), p. 11.

[7] Verner and Millerd, op. cit. See also: Isaac Akinbode, Farmers' Contacts with District Agriculturists, Vancouver: Faculty of Education, University of British Columbia, 1969.

ECONOMIC CHARACTERISTICS

Certain measurable economic characteristics are generally found to be associated with the adoption of innovations as well as with certain of the personal characteristics discussed above. These economic factors are discussed below.

Farm Operations

Most of the respondents (80 per cent) reported small fruit as the major farming enterprise while six per cent reported vegetables, and 4 per cent were mainly in dairying or poultry. Other major enterprises included beef cattle or hogs, potatoes, green-houses and seed production. Secondary enterprises were distributed among 54 per cent of the respondents with 19 per cent indicating small fruit and 10 per cent vegetables. In addition, 7 per cent mentioned beef cattle or hogs, while dairying, poultry, and potatoes were each reported by 5 per cent of the respondents.

Farm Size

Total farm size ranged from less than 3 acres to over 180 acres. The median category of 5 to 14 acres included 37 per cent of all respondents, with the next largest group (22 per cent) being in the 15 to 30 acre category. Nine per cent had farms exceeding 50 acres, while 17 operators managed holdings of less than 5 acres.

Respondents with large farms also had the largest acreages in strawberries (r = .81) and in other agricultural enterprises (r = .94). Sixty-four of the 81 operators with a total acreage of less than 30 acres and 7 of the eleven operators with 120 acres or more reported small fruit as the major enterprise. One half of the respondents, including 41 of the 64 operators who were predominantly strawberry growers, cultivated less than 5 acres of strawberries with 33 per cent reporting less than 3 acres. Thirty-one per cent reported between 5 and 15 acres, 12 per cent between 16 and 49 acres, and 7 per cent 50 or more acres. All of the operators with 30 or more acres in strawberries had farms of at least 50 acres.

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[8] For a more detailed analysis of Extension Contacts see Alleyne and Verner, op. cit.

Secondary enterprises were reported by 21 of the 24 operators with more than 30 acres but only by about one half of the 76 operators with less than 30 acres. Fifteen respondents had no improved acreage devoted to agricultural operations other than strawberry cultivation. Twenty-nine per cent reported less than 5 acres, 38 per cent between 15 and 29 acres and 10 per cent 80 or more acres. Secondary enterprises were mostly small fruit, dairying, cattle, poultry, vegetables or potatoes.

Adoption was positively and significantly related to total farm acreage (r = .35), acreage in strawberries (r = .52), and to acreage in other agricultural enterprises (r = .33).

Gross Agricultural Income

One respondent refused to give information relevant to income and 3 others reported no sales of agricultural produce in 1966. Eighteen per cent of the respondents reported less than $3,000 sales from all farm products, compared to 35 per cent in that category for gross income from strawberry sales only. The median category for total agricultural sales was $5,000 to $10,000 compared to the median of $3,000 to $5,000 from strawberry sales. Gross agricultural sales exceeded $55,000 for 15 operators and 10 operators were in that category from strawberry sales only.

More than one quarter (28 per cent) of the operators did not receive income from the sale of agricultural products other than strawberries in 1966.

Thirty-one per cent received less than $5,000 while 10 per cent received more than $40,000. As seen in Table 1, there are the expected relationships between acreage and sales in all respects. Most of the respondents receiving more than $15,000 total gross sales were predominantly small fruit growers, with poultry and vegetables second in importance. Among those reporting the highest gross incomes from agricultural products other than strawberries, the major farm enterprises were mainly dairying, poultry and vegetables. All gross measurements of agricultural income were consistently and positively related to adoption.

Tenure

Eighty respondents owned their holdings completely, while 17 per cent reported a combination of ownership and rental. Two respondents reported that they rented all of their land and one was a farm manager. Higher levels of ownership were positively related to attendance at specific agricultural education activities such as meetings, field days, and demonstrations.

Labour Employed for Harvesting

Ten respondents reported that they did not employ labour for harvesting in 1966 and of this number, 6 had less than 3 acres in strawberries and 4 had between 3 and 4 acres. Some small operators harvested their crop using family labour only or in combination with the "U-Pick" system whereby the buyer picks the crop himself. The majority of farmers (53 per cent) employed 25 pickers or less. Each of the 7 operators with 50 or more acres in strawberries employed at least 200 pickers; two operators with more than 80 acres employed more than 600 pickers each. The expected relationships between the employment of labour and the acreage and gross income characteristics is evident in Table 1, with the correlations ranging between .77 and .88.

Farm Value

Estimated farm value ranged from less than $5,000 to more than $150,000 with the median category of $30,000 to $59,000 including 36 respondents while a like number valued their farms between $10,000 and $29,000. Three farms were valued at less than $10,000 and 14 at more than $150,000. Farmers living in areas having a potential for housing and industrial development mentioned the inflated value of farm land in estimating the value of their particular farm.

The block pattern of significant partial correlation coefficients illustrates the expected consistent relationships between farm value and all of the acreage characteristics. In addition, operators with higher valued farms were resident on the same farms for longer periods ($r = .32$) and exhibited a higher level of adoption ($r = .32$).

ETHNIC INFLUENCES

The strawberry growers in the Lower Fraser Valley included a number of individuals identifiable as members of specific ethnic groups. Previous adoption studies have shown distinct differences in adoption or communication behaviour between such groups. Pedersen,[9] in his study of Danish and Polish subcultures in a single region, found evidence which indicated that different cultural adjustments either facilitated or hindered the introduction and acceptance of new ideas. The Danish group consistently showed a higher level of performance for all practices, and adopted recommended practices to a significantly greater extent than did the Polish group. Pedersen concluded that the ethnic groups constituted different universes in terms of reaction to the recommended dairy farm practices.

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[9] Harold A. Pedersen, "Cultural Differences in the Acceptance of Recommended Practices", Rural Sociology, 16:37-49, (March, 1951).

Van den Ban[10] also sought to explain differences in adoption behaviour in terms of differences in "ethnic cohesiveness" between two groups of Calvinistic Dutch and Norwegian-German Lutheran farmers. There were significant differences between township quartiles regardless of individual farmer prediction scores based on the usually accepted major socio-economic variables. Van den Ban concluded that the influence of social structures was more important than values directly related to adoption.

Verner and Gubbels examined ethnic influence among dairy operators in the same locale as the present study and found no significant differences with respect to adoption score but did find minor differences in certain socio-economic characteristics.[11]

Among the sample studied here, 32 per cent were identified as Menonites and 23 per cent as Japanese. The remaining 45 per cent were classified as "other". The majority of the Japanese respondents (65.2 per cent), and of those classified as others (51 per cent) were Canadian born compared to only 19.2 per cent of the Menonites. The chi-square test at the .01 level was used to test the null hypothesis of no statistically significant difference with respect to a number of socio-economic characteristics between the ethnic groups. The variables showing significant differences are listed in Table II.[12]

Menonites reported considerably less formal education, compared to other ethnic groups. Seventy-three per cent had 8 or less years of schooling, compared to 43.5 per cent for Japanese and 47.1 per cent for other respondents. The educational level of wives was similarly distributed as the percentages in this category were 65.4 per cent (Menonites), 21.7 per cent (Japanese) and 35.3 per cent for others. The data for Japanese wives is somewhat misleading since 26.1 per cent of the Japanese respondents were either single or did not indicate the wife's educational level.

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[10] A.W. Van den Ban, "Locality Group Differences in the Adoption of New Farm Practices", Rural Sociology, 25:308-320, (September, 1960).

[11] Verner and Gubbels, op. cit., pp. 23-24.

[12] Detailed distributions are shown in Appendix I.

TABLE II

STATISTICALLY SIGNIFICANT CHI-SQUARE VALUES FOR SOCIO-ECONOMIC CHARACTERISTICS BY ETHNIC ORIGIN

Socio-Economic Characteristic	Chi-square Value	Degrees of Freedom
Agricultural adult education	17.00	2
Education	21.94	4
Vocational agricultural education	18.31	2
Wife's education	50.00	4
Years in Strawberry	36.70	4
Years on the present farm	76.71	4
Social participation	22.00	4
Size of farm	14.00	4
Acreage in strawberry	38.70	4
Acreage in other agricultural enterprises	53.90	4
Gross total agricultural sales	39.60	4
Gross total sales from strawberry	45.00	4
Gross total sales from other agricultural enterprises	55.14	4
Tenure	19.47	2
Off-farm work	16.04	2
Farm value	29.28	4
Telephone Contact (D.H.)	28.37	4
Farm Visits (D.H.	40.42	4
Mail Contact with (D.H.)	18.21	4
Radio Contact with (D.H.)	21.97	2
Newspaper articles (D.H.)	28.04	4
Attendance at L.M.H.I.A. short course (1966)	35.46	2
Attendance at L.M.H.I.A. short course (1967)	37.70	2

Menonites were also the least active in terms of social participation. Thirty-five per cent of that group had a zero score, compared to 13 per cent for Japanese and 7.8 per cent for others. On the other hand, Japanese (78.2 per cent) and others (78.5 per cent) were at the median level of social participation score compared to 61.6 per cent of the Menonites.

Respondents classified as "others" had the larger, higher valued farms, the largest acreages in strawberries and in other agricultural enterprises, and received the most total income from agriculture. Most of the Japanese had other agricultural enterprises involving between 3 to 15 acres and received more gross sales from these enterprises. Complete farm ownership was also more characteristic of Japanese respondents.

Menonites seemed to concentrate more than other groups on strawberry cultivation, with twice as many individuals compared to the other two groups reporting less than three acres in other agricultural enterprises. This is perhaps partly explained by the fact that a larger proportion also spent more than half their normal working hours on off-farm jobs which would not permit much time for different agricultural enterprises with varied management requirements.

Personal contact with the District Horticulturist was lowest among the Japanese population, and highest among those respondents who were neither Menonite nor Japanese. More than half the Japanese farmers (57 per cent) compared to 46 per cent of Menonites and 23 per cent of the third group reported no telephone contact. A similar pattern was observed for farm visits, with 70 per cent of the Japanese farmers reporting no contact. While 28 per cent Menonites and 23 per cent of the "others" had a high level of contact by farm visits, only 4.4 per cent of the Japanese farmers were in this category. The chi-square test did not reveal any significant differences between the groups for office visits.

Japanese respondents also reported the lowest level of contact by radio while twice as many Menonites compared to all other groups reported radio contact. The "other" group indicated a significantly higher contact level by means of newspaper articles.

SUMMARY

In this population there were an unusually small number of personal characteristics which produced any statistically significant relationships to adoption score. Of these, age showed a negative relationship while education of the wife and social participation produced positive relationships. This absence of significant personal characteristics may well be a product of the nature of the population itself. In testing for relationships among three identifiable ethnic groups it was found that they differed significantly from each other to such an extent as to constitute virtually three distinct populations. Thus, in analyzing the characteristics of the three groups as one, they tended to cancel out any potential significance of particular personal characteristics. Unfortunately, this was not perceived in time to make independent analyses of the three groups.

The expected economic characteristics were found to be related to adoption score at a statistically significant level. Thus, for the sample as a whole, size of farm, sales, and farm value were significant.

CHAPTER THREE

ADOPTER CATEGORIES AND THE ADOPTION OF INNOVATIONS

Adoption research has consistently attempted to classify individuals in terms of their relative positions on a continuum relevant to the adoption of a specific innovation or set of innovations over time. Rogers[1] emphasizes the utility of this concept in terms of communicating research findings and their implications to lay audiences and change agents.

While there has been considerable variation in the terminology used to identify selected subdivisions of individuals within the social system with respect to adoption, the categories developed by Rogers are the most widely accepted. The major criterion used for this purpose is "innovativeness".[2] His system of adopter categorization is based on the finding that the adoption of innovations either follows the normal distribution or closely approximates normality over time. Individuals within the social system are partitioned on the basis of their earliness to adopt the innovation or set of innovations which, in turn, determines their relative position about the mean of the normal distribution.

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[1] E.M. Rogers, "Categorizing the Adopters of Agricultural Practices." Rural Sociology, 23:345-354, (December, 1958).

[2] E.M. Rogers, Diffusion of Innovations. New York: The Free Press of Glencoe, 1962, p. 159.

Characteristics of Adopter Categories

The characteristics of individual farmers relevant to their classification in adopter categories have been continuously investigated. Rogers'[3] generalizations indicate that early adopters, compared to later adopters, are younger in age and are characterized by higher social status, a more favourable financial position, more specialized operations, a different type of mental ability, the utilization of a greater number of different information sources which are in closer contact with the origin of new ideas, and the greater use of more impersonal sources of information.

Bohlen[4] points out that innovators and early adopters are characterized by greater emphasis on economic profit maximization, greater willingness to take risk, shorter adoption periods, less concern about the trustworthiness of an information source as distinct from the supporting expertise, greater participation in secular and Gesellschaft systems as distinct from sacred and Gemeinschaft systems, and a higher professional orientation towards farming. Research has not been in total agreement on all aspects of the significance of socio-economic variables and their relationship to adopter categories.

CLASSIFICATION OF RESPONDENTS INTO ADOPTER CATEGORIES

The adoption score was used in this study for classifying respondents into adopter categories. The total score for any respondent is cumulative in terms of his reported stage in the adoption process for each practice at the time of the interview.[5] Recorded scores ranged from 10 to 30 with a mean of 25.70

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[3] Rogers, Diffusion..., op. cit., p. 313.

[4] Joe M. Bohlen, "The Adoption and Diffusion of Ideas in Agriculture". Our Changing Rural Society, edited by James H. Copp, Ames: Iowa State University Press, 1964, pp. 279-380.

[5] The values assigned to different stages are 0 for not aware, 1 for awareness, 2 for interest, 3 for evaluation, 4 for trial and 5 for adoption. For the 6 practices, therefore, the possible total score for a respondent ranged between 0 for unawareness of any of the innovations to 30 for the adoption of all innovations.

and a standard deviation of 3.914. The general level of adoption by the sample was relatively high. Ten per cent had a score of 20 or less, 30 per cent scored between 21 and 25, 43 per cent 26 to ~~43~~ 29, and 17 per cent had the maximum score of 30. Using the procedure recommended by Rogers,[6] the subdivision of the sample into adopter categories was made on the basis of the mean and standard deviation.

The class limits for each category and the respective number of respondents are shown in Table III. The innovator-early adopter categories are combined since after separating the first three categories, all other respondents had the maximum score of 30. Categories were distributed as follows:

(1) Laggards - less than the mean minus one standard deviation (0-21) : 12 respondents

(2) Late majority - the mean minus one standard deviation to the mean (22-25) : 28 respondents

(3) Early majority - the mean to the mean plus one standard deviation (26-29) : 43 respondents

(4) Innovator - Early Adopters - greater than the mean plus one standard deviation (more than 29) : 17 respondents

Total 100 respondents

The chi-square test showed that the distribution of respondents within adopter categories approximated the normal curve.

RELATIONSHIP BETWEEN ADOPTER CATEGORY AND SOCIO-ECONOMIC CHARACTERISTICS

Since the use of adopter categories for classifying the individuals in a farm population relevant to practice adoption is a standard procedure, the

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[6] Rogers, Diffusion....., op. cit., pp. 161-163.

TABLE III

CLASSIFICATION OF THE RESPONDENTS INTO ADOPTER CATEGORIES

			Number of Respondents in each Category		
Adopter Category	Class Boundaries	Number of Standard Deviations from the Mean	Expected (Normal Frequency Curve) (e)	Observed Sample Frequency (n)	$\frac{(n-e)^2}{e}$
Early adopter-Innovator			15.75	17	.10
	29.6	+1			
Early majority			34.13	43	2.31
	25.7	0			
Late majority			34.13	28	1.10
	21.8	-1			
Laggard			15.75	12	.89
			Total	100 $X^2 =$	4.40

Note: The null hypothesis that the sample frequency distribution approximated the normal curve distribution was tested at the .01 level of significance. The hypothesis was accepted since the calculated chi-square value was below the critical value of 6.635.[7]

data were analysed further by testing for relationships between socio-economic characteristics and adopter categories. Adopter categories can be treated within limits, as being a quantitative variable, with a low value assigned at the laggard end and the highest value at the innovator-early majority extreme.

In order to test for "gross relationships" between individuals in the upper and lower levels of adoption performance the four categories previously indicated were combined to obtain two categories. This results in a "low" adoption category containing the laggards and late majority and a "high" adoption category including the early majority and early adopter-innovator respondents. Chi square was used to test for significant differences among the socio-economic characteristics of the respondents using two and four adopter categories and the resultant values are shown in Table IV.

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[7] This level of significance indicates "a (fairly) good fit", see John E. Freund and Frank J. Williams, Modern Business Statistics, Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1958, p. 260.

Age

The negative relationship indicated by partial correlation analysis against adoption score (r = -.31) and adopter categories (r = -.30) is supported by the miltivariate tabulation of the data. Eighty per cent of the respondents in the 20 to 34 age group were in the combined high adoption category, compared to 68.5 per cent in the 35 to 54 age group and 41.6 per cent for respondents 55 or more years of age. Similarly, 20 per cent of the respondents in the youngest age group were at the lower end of the adoption scale compared to 58.5 per cent of the oldest age group. The relationship has greater significance in terms of four adopter categories than with two categories only.

Number of Children

A significant difference was obtained for four adopter categories only. This is illustrated by the negligible difference between the proportion of respondents in the upper level adopter categories with 0 to 2 children (63.1 per cent) compared to those with three or more children (58.1 per cent). In comparison with the larger families, there were 29.2 per cent more respondents with 0 to 2 children in the early majority category, but 18.9 per cent less in the early adopter-innovator group. The relatively low chi-square value, even though significant at the .01 level, is perhaps explained by the non-significant but positive correlation (r = .15), between number of children and adoption.

TABLE IV

STATISTICALLY SIGNIFICANT CHI-SQUARE VALUES FOR SOCIO-ECONOMIC CHARACTERISTICS AGAINST TWO AND FOUR ADOPTER CATEGORIES

	Chi-square Value			
Socio-economic characteristic	Using 2 Adopter Categories	d.f.	Using 4 Adopter Categories	d.f.
Age	33.29*	2	51.27*	6
Number of Children			19.36*	3
Education Level	19.77*	1	22.08*	3
Educational Level of Wife	15.93*	1	15.98*	3
Agricultural courses in vocational school			29.87*	3
Agricultural adult education	5.33	1	10.38	3
Attendance at 1966 short course, L.M.H.I.A.	24.01*	2	30.76*	6
Attendance at 1967 short course, L.M.H.I.A.	31.16*	2	66.46*	6
Attendance at 1966 short course, U.S.A.	11.50*	1	15.43*	3
Attendance at 1967 short course, U.S.A.			11.50*	3
Years of farming experience			37.47*	6
Years in strawberries	32.54*	3	54.00*	9
Years on present farm	11.67*	3	42.68*	9
Ethnic origin	22.66*	2	33.01*	6
Social participation	44.72*	3	110.51*	9
Total acreage farmed	56.48*	3	104.40*	9
Acreage in strawberries	112.51*	2	85.76*	6
Acreage in other products	18.74*	2	33.78*	6
Total gross sales from agriculture	45.25*	2	74.08*	6
Gross sales from strawberries	68.24*	2	79.75*	6
Gross sales from other products	13.66*	2	31.94*	6
Amount of time spent in off-farm work			49.11*	6
Estimated value of farm	33.85*	2	37.05*	6

Note: The underlined values are significant at the .05 level. The null hypothesis is that there is no difference in the level of adoption due to the influence of the socio-economic characteristic.

* Significant at the .01 level.

The partial correlation analysis indicated that the younger respondents, who tended to have less children, were higher on the adoption scale. The relationship between age and number of children (r = .27) indicates that only about 9 per cent of the variation[8] in the number of children is accounted for by variation in age of the parent.

Education

The significant chi-square values were similar for the two and four adopter categories. Among respondents reporting more than eight years of schooling, 74.1 per cent were classified as earlier adopters and 25.9 per cent as late adopters. Among those with 8 years or less, the difference was not as marked. Late adopters included 52.8 per cent of the less educated and early adopters had 47.2 per cent.

Education of the Wife

In comparison with the analysis for the education of respondents, the education of the wife had lower chi-square values but these were similar for both two and four adopter categories. Among respondents with better educated wives, there were fewer (6.8 per cent) in the laggard category while 50.0 per cent were classed as early majority. For combined categories, the percentage distribution of wives at upper and lower adoption extremes within each educational level was almost identical with the distribution for respondents themselves, thus lending support to the value of .39 for partial correlation between the educational levels of respondents and their wives.

Agricultural Courses at Vocational School

The chi-square value was significant only for four adopter categories.

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[8] See K.H. Kurtz, Foundations of Psychological Research, Boston: Allyn and Bacon, 1965, p. 207.

There were no laggards among those who had taken such courses. Among respondents who took courses 42.8 per cent were in the early adopter-innovator category and 28.6 per cent in the early majority while only 20.0 per cent of those classed as late majority reported courses in vocational school.

Agricultural Adult Education

Attendance at agricultural adult education programs in 1966 was more characteristic of earlier than of later adopters although the difference was significant only at the .05 level. Of those who attended such programs, 68.0 per cent were in the earlier adopter group and 32.0 per cent among the later adopters. The largest single category reporting attendance was the early majority at 44.0 per cent.

Attendance at Short Courses (L.M.H.I.A.)[9]

The chi-square values are significant at the .01 level for attendance at the annual L.M.H.I.A. Short Courses in 1966 and 1967. Compared to the relationship for overall attendance at any agricultural adult education course, the chi-square values obtained are at least doubled for four adopter categories, and the increase is 5 to 6 times more for gross relationships when tested against two adopter categories.

There was a negligible difference between attendance or non-attendance for 1966 at the laggard level, but there was a larger percentage of respondents who did not attend in both lower adopter categories, with the reverse situation for attendance among the higher adopter categories. The percentage distribution at the higher adoption level increased with an increase in the number of days attended, but was more marked at the early adopter-innovator level where the difference was about 10 per cent. The percentage of respondents for the combined upper adopter categories was 49 per cent for non-attendance, 75 per cent for attendance on one day and 93 per cent for attendance on both days. At the early adopter-innovator level, the percentage for attendance on both days (35.3 per cent) was at least three times more than for non-attendance (11.8 per cent).

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[9] Lower Mainland Horticultural Improvement Association.

Years of Farming Experience

A significant distribution was indicated by the chi-square value for four adopter categories only. There was a slightly higher percentage of laggards among respondents with nine or less years of experience. The situation was reversed for the late majority category with almost double the percentage in each instance for respondents with 10 to 19 and 20 or more years of experience. There were no respondents in the early adopter-innovator category with nine or less years of experience, although 69.2 per cent with that level of experience were classified as early majority, compared to a range of 38 to 42 per cent for the more experienced farmers.

There was no difference among the two groups of more experienced farmers in terms of the percentage distribution among the adopter categories. Partial correlation analysis which controls the influence of other variables, gave an extremely low "r" value of .04 for the relationship between experience and adoption.

Number of Years in Strawberry Growing

The relationship between adopter category and years of experience in strawberry growing tends to show a consistent increase in the percentage distribution by each experience level from laggard to early majority. Among those with less than five years experience, 5.9 per cent were classified as laggards, 35.3 per cent late majority, 52.9 per cent early majority, and 5.9 per cent early adopter-innovator. Those with most experience were distributed in somewhat the same way with 14.3 per cent laggards, 25.0 per cent late majority, 35.7 per cent early majority and 25.0 per cent early adopter-innovator. Thus, experience itself neither insures the adoption of innovations nor necessarily inhibits it.

Number of Years on Present Farm

The relationship between adoption and this variable was somewhat similar to that found for experience with a strawberry crop. Among respondents with the longest period of residence, 4.0 per cent were classed as laggards, 28.0 per cent late majority, 52.0 per cent early majority, and 16.0 per cent were in the early adopter-innovator category. Those with the least experience were divided equally among the earlier and later adopters.

Ethnic Origin

The relationship between ethnic origin and adoption is emphasized by the distribution among adopter categories by ethnic origin. The Menonites were almost evenly divided between earlier and later adopters with 53.9 per cent and 46.1 per cent respectively. The Japanese were found more among the late adopters (60.9 per cent) than the earlier adopters (39.1 per cent). The ethnic category of "other" was overwhelmingly in the early adopter class with 72.5 per cent. Curiously, 23.1 per cent of the Menonites were classified in the early adopter-innovator category compared with 19.6 per cent of the other and 4.3 per cent Japanese. Among laggards the order differed with Japanese at 17.4 per cent followed by 11.5 per cent among Menonites and 9.8 per cent of the other group.

Social Participation

The positive significant relationship obtained by partial correlation analysis (r = .42) was borne out by the frequency distributions. In general, the percentage of laggards was inversely related to the level of social participation. There were 37.5 per cent laggards among respondents with a zero score, as against 5.9 per cent in the group with more than 24 points. This trend continued at the late majority level.

The positive relationship between adoption and social participation was particularly marked at the early majority level with 22.7 per cent having a zero score compared to 64.7 per cent with a score of more than 24. The combination of adopter categories further strengthens the relationship with higher performance adopter categories ranging between 27.3 per cent for a score of zero to 82.3 per cent for a score exceeding twenty-four.

Size of Farm

A positive relationship was evident between farm size and adoption. There was an inverse percentage distribution at the laggard and late majority level of adoption with an increase in the total acreage farmed. Laggards averaged 35.3 per cent for the 0 to 4 acres group, compared to 7.7 per cent for respondents with 30 to 119 acres; there were no laggards with farms exceeding 119 acres. In the upper adopter categories, combined percentages range through 29.4 per cent (0 to 4 acres), 61 per cent (5 to 29 acres), 69.2 per cent (30 to 119 acres) and 90.9 per cent for respondents with more than 119 acres.

Acreage in Strawberries

The relationship between acreage in strawberries and adoption was similar to that indicated for farm size. There was the same inverse relationship with adoption at the lower adoption levels and a positive relationship for upper adopter categories. The latter relationship is illustrated by the combined percentage range of 30.3 per cent for the less than 3 acre group, compared to 89.5 per cent for respondents with 30 or more acres.

Acreage in Other Agricultural Enterprises

The chi-square values were significant for both two and four adopter categories and the partial correlation coefficient (r = .33), while statistically significant, was the smallest for all acreage measurements.

There was no consistent trend in the data. The percentage of laggards decreased as acreage increased; 21.4 per cent for the 0 to 2 acre group, 10.3 per cent for 3 to 14 acres and 6.1 per cent for 15 or more acres. A positive relationship was most evident at the early majority level between extreme acreage groups; the percentage distribution ranged from 36 per cent for 0 to 14 acres, to 57.6 per cent for more than 14 acres. Combined percentages at the upper adoption level were 60.8 for 0 to 2 acres and 72.7 per cent for 15 or more acres, with the lowest percentage (48.7 per cent) in the 3 to 14 acre group.

Gross Total Sales from Agriculture

There is some evidence of a relationship between adoption and the total gross income from agricultural sales. Except at the early adopter-innovator level, the difference in the distribution is marked only between respondents reporting sales of less than $5,000 and those with $5,000 or more. In general, the percentage of respondents at the lower adoption levels decreased with an increase in income, ranging from a combined percentage of 68.6 per cent for the lowest income group to between 22 and 26 per cent for those with sales totalling $5,000 or more.

The reverse trend occurred at the early adopter-innovator level; percentages increased continuously with income from 8.6 per cent for respondents reporting less than $5,000 to 30.4 per cent for those with more than $25,000. When percentages were combined for upper adoption categories, 73.8 per cent of the respondents reporting $5,000 to $25,000 and 78.2 per cent of those reporting more than $25,000 were early adopters. On the other hand, the percentage for respondents reporting less than $5,000 (31.4 per cent) was much lower.

Gross Sales from Strawberries

The variable gross receipts from the sale of strawberries, which is specific to the innovations under consideration in this study, showed a more consistent relationship to adoption than did total gross agricultural income in that the chi-square values were larger, especially in terms of two adopter categories.

There were 25.6 per cent classed as laggards among respondents reporting $3,000 or less, and none among those reporting more than $5,000. Combined percentages showed that 64.1 per cent of the respondents in the lowest income group were late adopters, compared to only 36.2 per cent for those reporting $3,000 to $5,000 and 8.0 per cent among respondents receiving more than $5,000. The positive relationship between the two variables is very evident at the upper adoption level. Early adopters comprised 35.9 per cent of the respondents reporting less than $3,000, 63.8 per cent with $3,000 to $5,000, and 92 per cent of those reporting more than $5,000 from the sales of strawberries.

Gross Sales from Other Agricultural Enterprises

The chi-square values again seem to emphasize that while there is a relationship between the size of the farm operation and practice adoption, its strength and consistency decreases when the variable is not specific to the particular innovations under consideration. The positive relationship indicated by the partial correlation coefficient (r = .49) is clearly evident at all levels of adoption between respondents reporting less than $3,000 and those receiving more than $15,000. The middle sales category ($3,000 to $15,000) did not always show a consistent relationship between income and adoption.

The percentage distribution for laggards decreased with an increase in sales: 18.4 per cent in the lowest income group (less than $3,000), 6.9 per cent in the middle income group ($3,000 to $15,000), and 4.5 per cent for income exceeding $15,000. At the early majority level, the trend was more limited with 34.7 per cent in the lowest income group, compared to 50.0 to 51.7 per cent for the higher income groups. Combined percentages best indicate the expected pattern; the distribution at the upper adoption level ranged from 52 per cent in the less than $3,000 group to 58.6 per cent in the middle group and to 79.3 per cent where sales exceeded $15,000.

Amount of Time Spent in Off-Farm Work

The chi-square value was significant for four adopter categories only. There were 16.7 per cent classified as laggards among respondents reporting no off-farm work compared to 7.2 per cent for those who worked one-half or more or their normal working hours on off-farm jobs.

At the upper adoption level, 51.6 per cent of those reporting no off-farm work were in the early majority category, compared to 25.0 and 32.1 per cent for those reporting off-farm jobs. The percentage distribution again reverses at the early adopter-innovator level. Combined percentages at the upper adoption level removed any evidence of a trend since the number of respondents at either extreme was approximately 62 per cent.

Estimated Farm Value

The relationship between farm value and adoption was similar to that indicated for the total acreage farmed which is to be expected since the two variables are related. The percentage of respondents at each of the low adoption levels was higher with the lowest valued farms and decreased with increasing farm value. At each of the upper adoption levels, the positive relationship was illustrated: combined percentages ranged from 41 per cent (less than $3,000) to 70.7 per cent ($30,000 to less than $90,000) and the figure was 78.9 per cent for farms valued at $90,000 or more.

SUMMARY

Although there were very few socio-economic characteristics which produced statistically significant relationships with adoption score, there were a number of characteristics which differentiated among adopter categories. But these held no surprise as they tended to be consistent with significant variables generally common to other adoption research. Of particular interest here is the role of ethnic origin and the differences in the distributions among the adopter categories of the three ethnic groups identified. This tends to support the suggestion made earlier that ethnic origin influences the role of socio-economic variables in adoption when the characteristics of the total sample are handled as a single entity.

CHAPTER FOUR

ADOPTION BEHAVIOUR

The adoption of an innovation involves a sequential series of discrete behaviours which represent individual responses to an innovation. Traditional research has assumed that the adoption process involves only a simple dichotomy of rational behaviour in which the alternative responses are acceptance or not. This presupposes that only acceptance of the innovation exemplifies rational behaviour, consequently, an individual adoption score is computed on the basis of the stage achieved in the adoption process. Thus, the five classic stages in the adoption process--Awareness, Interest, Evaluation, Trial and Adoption--represent a sequence of rational responses that must be positive without allowing for other kinds of responses.

Beal et. al.[1] established the validity of this concept of stages in the adoption process. In their study they found that the respondents were aware of having gone through meaningful stages in their decision to adopt an innovation. Rogers[2] has emphasized that the 5-stage model is an arbitrary subdivision for conceptual purposes, and is based on apparent evidence of five main functions being involved in the adoption process. He suggests that any further subdivision into more or less stages should only be undertaken if the result is more fruitful analysis. Concerning the five stage process, he states, "until more evidence is available, it seems conceptually clear and practically sound to utilize the five-stage adoption process."[3] In general, Roger's model is the one most widely accepted and used in adoption research.[4]

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[1] George M. Beal, Everett M. Rogers and Joe M. Bohlen, "Validity of the Concept of Stages in the Adoption Process", Rural Sociology, 22:166-168, (June, 1957).

[2] Rogers, Diffusion...., op. cit., p. 79.

Some recent studies have questioned the validity of this 5-stage model. Waisanen[5] has proposed the inclusion of two additional stages. The first is a "generalized interest" stage which caters for change orientation in terms of a general "receptivity" to innovations. He makes the point that the "evaluation" stage, in the popular 5-stage model, involves a value prediction by the individual when he lacks personally acquired evidence. Waisanen therefore suggested that the evaluation stage should be followed by a "trial evaluation" stage, which permits a re-examination of the "prediction inherent in the earlier evaluation", and which is not based on actual acquired evidence.

Campbell[6] suggests that the traditional 5-stage model is too simple to account for many of the decisions involved in the adoption of innovations. His paradigm of individual decision-making and adoption is constructed around two dichotomies. These are rational or non-rational, and innovation or problem-oriented decisions, thus providing four "ideal type" processes when the two dimensions are combined in alternative arrangements.

Campbell further questions the traditional assumption of rationality in the current diffusion model which projects adoption as the "natural result" of evaluation, thereby implying rationality. He points out that rejection of an innovation may also be the result of a rational decision, and that the "rational traditional" model does not allow for rational and non-rational behaviour in terms of both adoption and non-adoption. Thus, rejection is a decision not to adopt the innovation. This, of course, may be either rational or irrational depending upon the particular situation. Bohlen[7] as well as Rogers and Pitzer[8] have emphasized the need for further detailed research into this aspect of adoption behaviour.

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[3] Ibid., p. 98.

[4] Bohlen, op. cit., p. 269.

[5] F.B. Waisanen, "Change Orientation and the Adoption Process", in D.T. Myren, editor First Inter-American Research Symposium on the Role of Communications in Agricultural Development, (Mexico City, Mexico, October, 1964), pp. 85-87.

[6] Rex R. Campbell, "A Suggested Paradigm of the Individual Adoption Process", Rural Sociology, 31:458-466, (December, 1966).

In addition to rejection, there is a further phase of the total adoption process not normally taken into account which involves discontinuance or the decision to cease use of an innovation after previously adopting it. While the absence of standardized terminology has made comparison between different studies difficult, between 20 and 50 per cent discontinuance has been recorded.[9] Incorrect initial usage or the faulty evaluation of trial results may be the causal factor in discontinuance.[10]

Bishop and Coughenour[11] cite a study in which adoption and discontinuance occurred at about the same rate. Later adopters, including laggards, tended to discontinue practices at more than double the rate reported for early adopters.[12] [13] Discontinuance is not solely the result of economic reasons: potential discontinuance is higher where the application of the practice requires multiple decisions and where adoption hinges upon complex relations relevant to other farming operations.

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[7] Bohlen, op. cit., p. 284.

[8] E.M. Rogers and R.L. Pitzer, The Adoption of Irrigation by Ohio Farmers, Ohio Agricultural Experiment Station, Wooster, Ohio, 1960. (Research Bulletin 851).

[9] Rogers, Diffusion...., op. cit., pp. 89-90.

[10] Leuthold, op. cit., p. 112.

[11] R. Bishop and C.M. Coughenour, Discontinuance of Farm Innovations, Department of Agricultural Economics and Rural Sociology, Ohio State University, 1964. (Department Series A.E. 361).

[12] Ibid., p. 4.

[13] Rogers, Diffusion...., op. cit., p. 90.

Verner and Gubbels[14] introduced the concept of innovation response state in order to categorize respondents in terms of their decision regarding a practice at any moment in time. Their five innovation response states include: Unawareness, Continuation in the adoption process, Rejection, Adoption, and Discontinuance. This in no sense replaces the classic five stages in the adoption process but it does identify an individual's relationship to an innovation in terms of behaviour in response to the innovation without assuming that only a positive response is rational.

A farmer's response to an agricultural innovation involves decision making which is influenced by a variety of factors and forces. As indicated earlier, certain socio-economic characteristics have been found to be associated with the decision to accept or adopt an innovation. In addition, the characteristics of the innovation itself can be influential and it would seem that profitability cannot by itself ensure the adoption of innovations for the majority of farmers. According to Bohlen,[15] acceptance of an innovation involves a re-orientation of values on the part of an individual so that the alteration and substitution of attitudes and beliefs may become necessary. Adoption behaviour has been found to vary with respect to the innovation, consequently, Rogers[16] suggests five major characteristics of an innovation which may influence adoption:

1. relative advantage - the degree to which an innovation is superior to ideas it supersedes.
2. compatibility - the degree to which it is consistent with existing values and past experiences of the adopter.
3. complexity - relative difficulty to understand and use.
4. divisibility - extent to which the nature of the practice permits trial on a limited basis.

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[14] Verner and Gubbels, op. cit., p. 45.

[15] Bohlen, op. cit., p. 272.

[16] Rogers, Diffusion...., op. cit., pp. 124-133.

5. communicability - degree to which results can be diffused to others.

Between 16 and 60 per cent of the variation in adoption has been explained by these factors either singly or in combination.[17] Fliegel and Kivlin[18] list additional items in more detail including mechanical attraction, initial and continuing cost, saving of time and the saving of physical discomfort.

ADOPTION AND NON-ADOPTION

In order to examine adoption behaviour, respondents were asked about their progress through the adoption stages for each of the innovations. As would be expected, very few respondents could indicate clearly their stage in the adoption process, and it was necessary to determine the actual stage by further discussion in an attempt to follow the pattern of the adoption process as recalled by the respondent. In many instances, this contributed to clarification of the actual stage in the adoption process.

Progress Toward Adoption of the Innovations

An overall indication of the progress toward adoption by the sample of farmers is indicated by the following averages for the 6 innovations at each stage in the adoption process: not aware 0.1; aware 0.08; interest 0.4; evaluation 0.7; trial 0.5; and adoption 4.12.

The range for not aware was between 1 and 8 per cent recorded for only three innovations of which two were the most recently introduced. (Table V). At the awareness stage, the percentage ranged between 1 and 5 per cent recorded for three practices including two of the three indicated for not aware. Respondents who were at the awareness stage included four laggards, three late majority and one early majority.

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[17] Ibid., pp. 135-136.

[18] Frederick C. Fliegel and Joseph E. Kivlin, Differences Among Improved Farm Practices as Related to Rates of Adoption, College of Agriculture, Pennsylvania State University, Pennsylvania, 1962 (Bulletin 691).

TABLE V

PERCENTAGE DISTRIBUTION OF RESPONDENTS AT EACH STAGE IN THE ADOPTION PROCESS BY INNOVATION

Innovation	Stage							
	Not Aware %	Aware %	Interest %	Evaluation %	Trial %	Adoption %	Discontinuance %	Total %
1. Soil analysis for nematode control.	8.0	2.0	8.0	23.0	9.0	50.0	0.0	100.0
2. Captan for fruit rot control.	1.0	0.0	7.0	2.0	14.0	76.0	0.0	100.0
3. Cultural operation-change from hill to matted row.	0.0	0.0	2.0	4.0	10.0	83.0	1.0	100.0
4. Chemical weed control.	0.0	1.0	5.0	12.0	5.0	76.0	1.0	100.0
5. Picking carts.	5.0	5.0	21.0	27.0	9.0	33.0	0.0	100.0
6. Virus-free plants.	0.0	0.0	0.0	0.0	6.0	94.0	0.0	100.0
Average: All Innovations	2.3	1.3	7.2	11.3	8.9	68.6	0.3	100.0

The percentage of respondents at the interest and evaluation stages was much larger, ranging from 2 to 21 per cent for interest and from 2 to 27 per cent for evaluation. Each of these stages were relevant to five of the six innovations.

Respondents were recorded at the trial stage for all six practices, with the highest percentage (14 per cent) found in the use of Captan for fruit rot control. Adoption ranged between 33 per cent for the use of picking carts and 94 per cent for virus-free certified plants. All innovations, except the use of picking carts, were adopted by at least 50 per cent of the respondents. The percentage distributions between stages in the adoption process for each practice are given in Table VI.

TABLE VI

PERCENTAGE DISTRIBUTION OF RESPONDENTS AT EACH STAGE IN THE ADOPTION PROCESS BY ADOPTER CATEGORY

Stage Reached	Adopter Category Laggard %	 Late Majority %	 Early Majority %	 Early Adopter-Innovator %
Not Aware	18.0	0.6	0.0	0.0
Awareness	5.6	1.8	0.4	0.0
Interest	19.4	10.7	4.2	0.0
Evaluation	11.1	19.0	10.9	0.0
Trial	15.3	13.7	7.3	0.0
Adoption	30.6	53.0	77.2	100.0
Total	100.0	98.8*	100.0	100.0

* 1.2 per cent accounted for discontinuance. $X^2 = 161.17$, d.f. = 15, $p < .01$.

Except for a single instance involving a late majority respondent, unawareness of innovations was indicated only by laggards and, except for late majority respondents at the evaluation stage, the percentage of respondents at each stage decreased within each of the first five stages in the direction of higher adoption performance, as indicated by adopter category. For example, while laggards were 5.6 and 19.4 per cent respectively at the awareness and interest stages, the corresponding percentages for early majority were 0.4 and

4.2 per cent. At the early adopter-innovator level, 100 per cent adoption was recorded for all practices.

At the evaluation stage, the percentages of laggards (11.1 per cent) and early majority (10.9 per cent) were almost the same with a much higher percentage (19.0 per cent) for late majority. The trend continued at the trial stage, with the largest percentage among laggards (15.3 per cent) compared to 7.3 per cent for early majority.

A complete reversal of the trend in percentage distribution occurred at the adoption stage. There was a continuous increase from a low 30.6 per cent for laggards to 100 per cent for the early adopter-innovators. In the data shown by Verner and Gubbels[19] the reverse in the percentage distributions occurred at the evaluation stage, while in this study the change did not occur until the adoption stage and the early adopter-innovators were all at the adoption stage.

INNOVATION RESPONSE STATE

The five possible innovation response states identified by Verner and Gubbels[20] were used in this analysis and the innovation response state for each practice is given in Table VII. The relative percentage distributions for unawareness and adoption are identical with those same categories presented in the previous analysis.

The percentage distributions for different response states would seem to bear some definite relationship to available knowledge concerning the innovations. The high adoption percentages for virus-free plants (94 per cent) and the change from hill planting to the matted row system (83 per cent) are partially

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[19] Verner and Gubbels, *op. cit.*, p. 42.

[20] *Ibid.*, p. 45. The five innovation response states are Unawareness, Continuation in the adoption process, Rejection, Adoption and Discontinuance.

TABLE VII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY INNOVATION RESPONSE STATE FOR EACH INNOVATION

	Innovation Response State					
Innovation	Not Aware %	Continuing the adoption process %	Rejection %	Adoption %	Discontinuance %	Total %
1. Soil analysis for nematode control.	8.0	26.0	16.0	50.0	0.0	100.0
2. Captan for fruit-rot control.	1.0	15.0	8.0	76.0	0.0	100.0
3. Cultural operation--change from hill to matted row.	0.0	10.0	6.0	83.0	1.0	100.0
4. Chemical weed control.	0.0	12.0	11.0	76.0	1.0	100.0
5. Picking carts.	5.0	21.0	41.0	33.0	0.0	100.0
6. Virus-free plants.	0.0	4.0	2.0	94.0	0.0	100.0
Average: All Innovations	2.3	14.7	14.0	68.6	0.3	100.0

explained by the fact that these were the first of the six practices to be introduced to this population of farmers. No respondents were unaware of these two practices.

A detailed analysis[21] for the adoption of disease-resistant plants showed that the percentage of adoptions increased from the laggards (83.3 per cent) to the early adopter-innovator category (95.4 per cent). This difference is relatively small but it is the least difference observed among the six innovations. Of the few respondents who did not adopt this practice, the percentage increased by adopter category with each step lower. Non-adopters included 4.7 per cent in the early majority category, 7.1 per cent late majority and 16.7 per cent among the laggards. Rejection of the practice was reported only by laggards.

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[21] See Appendix II, Detailed Analysis of the Innovation Response States.

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The next highest percentage for adoption (83 per cent) was reported for the change from hill planting to matted row. Rejection of this innovation occurred both in the laggard category (33.3 per cent) and in the late majority (3.6 per cent). Those continuing with the adoption process included laggards (25 per cent), late majority (17.9 per cent) and early majority (4.6 per cent).

The adoption of Captan for fruit rot control was reported by 76 per cent of the growers; the only individual unaware of this practice was a laggard. The pattern of rejection among respondents showed a decreasing proportion in the direction of the higher categories. One third of the laggards (33.3 per cent) compared to 10.7 per cent of the late majority and 2.3 per cent of the early majority reported rejection while 25.0 per cent of the laggards and 28.6 per cent of the late majority were continuing with the adoption process compared to only 9.3 per cent of the late majority. One third of the laggards (33.3 per cent), almost twice the proportion of the late majority (60.7 per cent), and 88.4 per cent of the early majority respondents adopted the innovation.

The economic loss which may result from fruit rot damage has been indicated earlier, therefore, it is difficult for growers to stop using this practice even if they are dissatisfied with it. The highest percentage of growers reported that they were at the trial stage for this innovation which may suggest an inability or unwillingness to make a firm decision about it. Similarly, again except for the change over to matted rows, this practice had the largest combined percentage for interest and evaluation (9 per cent). Among the more recent innovations, a higher percentage of laggards (33.3 per cent) adopted this practice than any other.

Seventy-six per cent of the respondents reported adopting the use of chemical weed control and only a single individual reporting having discontinued the practice. The typical percentage distribution among adopter categories ranged between 16.7 per cent for laggards to 95.4 per cent for early majority and 100 per cent for the early adopter-innovators. A reverse distribution is shown for the states continuing and rejection. The combined percentage for these two innovation response states (23 per cent) is the same for both innovations involving the routine use of chemical treatments--captan and chemical weed control.

The adoption of soil analysis specifically for nematode control was reported by 50 per cent of the respondents. The percentage distribution ranged from 8.3 per cent for laggards to 62.8 per cent for the early majority respondents. More than one-half the laggards (58.3 per cent) and 3.6 per cent of the late majority were unaware of the innovation. This is the only innovation for which any but a laggard reported unawareness. Except for the use of picking carts, this practice had the largest percentage of rejection (16 per cent), and for continuing with the adoption process (26 per cent).

The high percentage of respondents in these two states is partly explained by a situation which was confined to this innovation. A number of respondents were aware of the economic safeguards resulting from actual field treatment thus, even though they never actually used soil testing, they had accepted the treatment whether its use was indicated or not. A few growers with very large acreages who practiced rotation felt that this provided adequate safeguards. While some respondents indicated that they had rejected the practice, others were still evaluating its merits and were considered to be continuing with the adoption process.

The use of picking carts as an innovation had the lowest percentage of adoptions (33 per cent) and the highest percentage of rejections (41 per cent). The percentage continuing in the adoption process (21 per cent) was also second only to that for the use of soil analysis in the control of nematodes. The practice was not adopted by any laggards, and varied from 17.9 per cent adoption by the late majority to 25.6 per cent by the early majority. Rejection was quite high within all three relevant adopter categories as this was reported by at least 50 per cent of the laggards, 57.1 per cent of the late majority and 46.5 per cent of the early majority. At least one quarter of the "majority" respondents had not yet made a firm decision about the innovation. This innovation was the most recently introduced and only 41 per cent of the laggards reported awareness although no other categories reported unawareness.

The relationship between innovation response state and adopter category is illustrated in Table VIII. Unawareness was largely confined to those respondents classified as laggards. Continuation in the adoption process was at the same general level for respondents in the lower adopter categories (22.2 to 23.8 per cent) with only 12.4 per cent among the early majority. The percentage of rejections increased away from the upper adopter category level while adoption showed the reverse trend.

TABLE VIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY INNOVATION RESPONSE STATE AND BY ADOPTER CATEGORY

Innovation Response State	Adopter Category			
	Laggard %	Late Majority %	Early Majority %	Early Adopter-Innovator %
Unaware	18.0	0.6	0.0	0.0
Continuing with the Adoption Process	22.2	23.8	12.4	0.0
Rejection	29.2	21.4	10.4	0.0
Adoption	30.6	53.0	77.2	100.0
Total	100.0	98.8*	100.0	100.0

* 1.2 per cent accounted for by Discontinuance

REASONS FOR DELAY IN THE ADOPTION PROCESS

For the purpose of this study, delay implies two or more years spent in the adoption process. Since the process begins with a respondent becoming aware of the innovation there are many reasons which may explain the span of time involved. The reasons given by respondents for delay were classified into two major sub-divisions: (1) those relating to a characteristic of the innovation, as suggested by Rogers;[22] and (2) non-specific or general reasons relating to the particular situation as seen by the respondent.

Characteristics of the innovations were of somewhat lesser importance (45.3 per cent) compared to general reasons (54.7 per cent). Among the former, failure to perceive the relative advantage of the innovation (23.6 per cent) and communicability, or difficulty in seeing the beneficial results of its application (17.3 per cent) were most outstanding. (Table IX).

The two categories of reasons for delay were almost evenly divided for three of the six innovations--chemical weed control, virus-free certified plants, and the change from hill planting to matted row. While there was a 12 per cent difference in favour of innovation characteristics for soil analysis relevant to nematode control, the percentages were much smaller for the use of Captan (22.2 per cent) and picking carts (36.0 per cent). In general, there was a predominance of responses relating to relative advantage, communicability, and miscellaneous situational factors. (Table X).

There was some difference in responses by adopter category between respondents at the upper and lower levels of adoption performance. Laggards and late majority respondents emphasized characteristics of the innovation (60 per cent), with special reference to relative advantage and communicability. On the other hand, early majority and early adopter-innovator respondents stressed situational factors. (Table XI).

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[22] E.M. Rogers, op. cit., pp. 124-133.

TABLE IX

PERCENTAGE FREQUENCY DISTRIBUTION OF REASONS FOR DELAY IN PROCEEDING THROUGH THE ADOPTION PROCESS FOR ALL INNOVATIONS COMBINED

Reasons for delay	Frequency %
By Characteristic of the Innovation	
Relative advantage	23.6
Compatibility	3.4
Complexity	0.5
Divisibility	0.5
Communicability	17.3
Sub-total	45.3
Other General Reasons	
Fear of evidence of crop damage	2.4
Needed more information	7.2
Unsatisfactory results by other farmers	0.9
Influenced by other farmers who decided not to adopt the innovation	0.9
Influenced by members of the respondent's family	0.5
Innovation considered to be costly	4.3
Miscellaneous situational factors	38.5
Sub-total	54.7
TOTAL FOR ALL REASONS	100.0

TABLE X

PERCENTAGE DISTRIBUTION OF REASONS FOR DELAY IN THE ADOPTION PROCESS BY INNOVATION

Reasons for Delay	Innovation					
	Soil Analysis for Nematode Control %	Captan for fruit-rot control %	Change from Hill to Matted Row %	Chemical Weed Control %	Use of Picking Carts %	Use of Virus-free Certified Plants %
By Characteristic of the Innovation						
Relative advantage	25.0	0.0	21.1	25.5	36.0	31.4
Compatibility	2.8	0.0	0.0	12.8	0.0	0.0
Complexity	0.0	0.0	0.0	2.1	0.0	0.0
Divisibility	2.8	0.0	0.0	0.0	0.0	0.0
Communicability	25.0	22.2	26.3	8.5	0.0	20.0
Sub-Total	55.6	22.2	47.4	48.9	36.0	51.4
Other General Reasons						
Fear or evidence of crop damage	2.8	0.0	0.0	8.5	0.0	0.0
Needed more information	5.5	7.4	7.9	6.4	4.0	11.4
Unsatisfactory results by other farmers	0.0	3.7	0.0	2.1	0.0	0.0
Influenced by other farmers who decided not to adopt the innovation	2.8	0.0	0.0	2.1	0.0	0.0
Influenced by members of the family	2.8	0.0	0.0	0.0	0.0	0.0
Innovation considered to be costly	5.5	3.7	0.0	2.1	12.0	5.7
Miscellaneous situational factors	25.0	63.0	44.7	29.8	48.0	31.4
Sub-Total	44.4	77.8	52.6	51.0	64.0	48.5
GRAND TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

TABLE XI

PERCENTAGE DISTRIBUTION OF REASONS FOR DELAY IN THE ADOPTION PROCESS BY ADOPTER CATEGORY

Reasons for Delay	Adopter Categories Laggards %	 Late Majority %	 Early Majority %	 Early Adopter Innovator %
By Characteristic of the Innovation				
Relative advantage	26.6	24.3	27.9	17.6
Compatability	6.7	0.0	3.5	4.1
Complexity	0.0	3.0	0.0	0.0
Divisibility	6.7	0.0	0.0	0.0
Communicability	20.0	33.3	11.6	16.2
Sub-Total	60.0	60.6	43.0	37.9
Other General Reasons				
Fear or evidence of crop damage	0.0	0.0	3.5	2.7
Needed more information	0.0	3.0	8.1	9.5
Unsatisfactory results by other farmers	0.0	3.0	1.2	0.0
Influenced by other farmers who decided not to adopt the innovation	6.7	3.0	0.0	0.0
Influenced by members of the family	6.7	0.0	0.0	0.0
Innovation considered to be costly	6.7	0.0	5.8	4.1
Miscellaneous situational factors	20.0	30.3	38.4	62.2
Sub-Total	40.1	39.3	57.0	62.2
GRAND TOTAL	100.0	100.0	100.0	100.0

Note: The chi-square test was used to test the null hypothesis of no significant difference among adopter categories, using only sub-totals. The chi-square value of 16.292 is significant at the .01 level.

These early respondents were more alert to changes and were obviously among the earliest to use the innovation, thus explaining reference to the need for more information and the fear of crop damage. One early majority respondent pointed out that his first trial with chemical weed control resulted in the destruction of five acres of his crop, together with some of that of his neighbour.

In discussions about reasons for delay in the adoption process it was evident that the growers were aware of an innovation but lacked sufficient knowledge and understanding to make an intelligent decision. With respect to soil analysis, some said that they had no soil problem which suggests that they had not experienced an infestation of nemotodes rather than that they were aware of the protection offered by the innovation.

In the case of Captan, a number of growers were unsure of its effectiveness. Specific recommendations directed at the local situation were not available for the first few years after the innovation was introduced so that inadequate field treatment and poor results in some instances discouraged a ready acceptance of this innovation which illustrates the importance that must be attached to the introduction of an innovation in order to insure success at the trial stage particularly since the benefit derived is not complete protection from rotted fruit but a reduction in the proportion of rotted to marketable fruit.

The use of picking carts, certified virus-free plants, and the change to the matted row system are innovations that are meant to replace clearly established practices but which are not striking in their relative advantage--especially to smaller growers who are not usually as keen on efficiency or as alert to means of reducing costs. With respect to the two latter practices, communicability is also involved. Some farmers said that since plants obtained from their own fields continued to give good yields they saw no need to buy certified plants.

Since some farmers felt that the use of the matted row system meant greater difficulty in weed control, adoption did not occur until they were also able to use chemical weed killers. This linkage in practice adoption is further illustrated by the fact that growers knew that matted rows meant a higher humidity which resulted in a greater incidence of fruit rot so they did not think it in their best interest to adopt the one innovation until they were able to adopt the other.

In the case of soil analysis for nematode control, an inability to have a soil test made locally was a major reason for delay. Some growers did not have their soil tested because field service was generally difficult to obtain should the test prove a need for soil treatment.

After the matted row system was first introduced, a number of farmers explained their delay in adoption as due to waiting until they changed over from growing the older British Soverign variety to newer varieties. Others made the change only when their entire crop was destroyed by one of the periodic freeze-outs. In any event, the use of this new system of layout was only possible in old fields when the grower decided to replant his crop. Delay in the adoption of virus-free plants seems to have been hampered by the experience of a few farmers with "bad plants"; in other instances they claimed that plants were not always available.

The most frequently stated reason for delay in the use of Captan was the small acreage under cultivation especially at the time of awareness of the innovation. The cost factor is also involved since even if the grower could afford the initial cost he would consider the investment to be uneconomical. Non-ownership of a sprayer, and the difficulty encountered by isolated growers in obtaining custom service were also mentioned.

REASONS FOR REJECTION OF THE INNOVATIONS

In many instances there is a degree of similarity between both the reason given and the percentage distribution of reasons given for rejection and those previously indicated for delay in the adoption process. Under characteristics of the innovation the responses were more evenly distributed between relative advantage (10.6 per cent) and communicability (12.1 per cent) while miscellaneous situational factors increased in importance by almost 20 per cent (57.6 per cent). (Table XII).

TABLE XII

PERCENTAGE FREQUENCY DISTRIBUTION OF REASONS FOR REJECTION OF ALL INNOVATIONS

Reasons for Rejection	Frequency %
By Characteristic of the Innovation	
Relative advantage	10.6
Compatibility	6.1
Complexity	1.5
Divisibility	0.0
Communicability	12.1
	30.3
Other General Reasons	
Fear or evidence of crop damage	3.0
Unsatisfactory results by other farmers	1.5
Innovation considered to be costly	7.6
Miscellaneous situational factors	57.6
	69.7
TOTAL	100.0

Communicability (30.8 per cent) was the most important characteristic indicated for soil analysis for nematode control relevant to the characteristic of the innovation. (Table XIII). Relative advantage and the cost of the innovation were evenly weighted (15.4 per cent). A number of laggard and late majority respondents rejected the innovation simply because they had "no problem"; two early majority respondents felt that crop rotation was adequate.

TABLE XIII

PERCENTAGE DISTRIBUTION OF REASONS FOR REJECTION BY INNOVATION

Reasons for Rejection	Innovation					
	Soil Analysis for Nematode Control %	Captan for fruit-rot control %	Change from Hill to Matted Row %	Chemical Weed Control %	Use of Picking Carts %	Use of Virus-Free Certified Plants %
By Characteristic of the Innovation						
Relative advantage	15.4	0.0	75.0	0.0	6.1	0.0
Compatibility	0.0	0.0	0.0	33.3	3.0	0.0
Complexity	0.0	14.2	0.0	0.0	0.0	0.0
Divisibility	0.0	0.0	0.0	0.0	0.0	0.0
Communicability	30.8	42.9	0.0	0.0	3.0	0.0
Sub-total	46.2	57.1	75.0	33.3	12.1	0.0
Other General Reasons						
Fear or evidence of crop damage	0.0	0.0	0.0	22.3	0.0	0.0
Unsatisfactory results by other farmers	0.0	0.0	0.0	11.1	0.0	0.0
Innovation considered to be costly	15.4	0.0	0.0	0.0	6.1	0.0
Miscellaneous situational factors	38.4	42.9	25.0	33.3	81.8	0.0
Sub-total	53.8	42.9	25.0	66.7	87.9	0.0
GRAND TOTAL	100.0	100.0	100.0	100.0	100.0	0.0

The failure to understand the advantages of Captan is again evident. One late majority respondent said that "they rotten anyway". Situational factors included too small an acreage to justify the expenditure or where the respondent had decided that he was about to stop growing the crop and was not willing to incur additional expenditure.

Concerning the use of matted rows, some respondents rejected the innovation because they felt that this practice resulted in an increase in the number of runners, too large a proportion of small berries, drying out of soil moisture on light soils in hilly areas, a need for more fertilizer, or a higher incidence of fruit rot.

One third of the reasons given for the rejection of chemical weed control were classified as compatibility. Some growers just did not "believe" in the use of chemicals. One laggard made it quite clear when he said: "the way they spray around here, every week, spray for this, spray for that, poison the whole bloody country." Unsatisfactory results by some farmers, and the general fear of crop damage accounted for 34.3 per cent of the reasons for rejection along with too small an acreage to warrant the expenditure.

An extremely high percentage of situational reasons were given for the rejection of picking carts. Growers in the low-lying Delta, Richmond and Ladner areas indicated that the oriental contract labour used for harvesting would not accept the change as expressed by one grower who said "Chinese don't go for anything new". In addition, these particular growers used a different type of field crate and basket arrangement which would have to be accepted by the cannery before they could consider using the new system. Others made mention of the fact that the heavier clayey soil in the area would make it difficult to use the carts under moist conditions. Growers in other areas said that their fields were too hilly, and that children employed at harvest time would have difficulty using picking carts. Some who had a large stock of hand carriers indicated that they were quite satisfied with this traditional method or that their size of enterprise was too small to justify additional expenditure.

A larger percentage of reasons relevant to innovation characteristics were given by laggards and late majority respondents, while situational factors and other general reasons were much more predominant with early majority respondents. (Table XIV).

SUMMARY

Since the acceptance or rejection of an innovation is a complex process, the use of the traditional five stage diffusion process as the sole measure of adoption does not explain adequately the response of the farmer to an innovation. Furthermore, the assumption in the "rational traditional" model that only adoption is the rational response to an innovation is not borne out by an examination of the reasons for delay, rejection, or discontinuance. In many instances these three responses may be the only completely rational response to a given innovation in a particular situation as indicated here.

An extended analysis of adoption behaviour may lead to a better perception of the ways in which certain identified socio-economic variables influence adoption behaviour and explain why they show a statistically significant relationship to adoption score so consistently.

TABLE XIV

PERCENTAGE DISTRIBUTION OF REASONS FOR REJECTION BY ADOPTER CATEGORY

Reasons for Rejection	Adopter Category			
	Laggard %	Late Majority %	Early Majority %	Early Adopter Innovator %
By Characteristics of the Innovation				
Relative advantage	16.5	4.5	11.5	0.0
Compatibility	5.6	4.5	7.7	0.0
Complexity	5.6	0.0	0.0	0.0
Divisibility	0.0	0.0	0.0	0.0
Communicability	5.6	32.0	0.0	0.0
Sub-total	33.3	41.0	19.2	0.0
Other General Reasons				
Fear or evidence of crop damage	5.6	4.5	0.0	0.0
Unsatisfactory results by other farmers	0.0	4.5	0.0	0.0
Innovation considered to be costly	5.6	0.0	15.4	0.0
Miscellaneous situational factors	55.5	50.0	65.4	0.0
Sub-total	66.7	59.0	80.8	0.0
GRAND TOTAL	100.0	100.0	100.0	0.0

Note: The chi-square test was used to test the null hypothesis of no significant difference among adopter categories, using only sub-totals for the 3 adopter categories in which responses are recorded. The chi-square value of 11.395 is significant at the .01 level.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

This study has described the adoption behaviour of strawberry growers in the Lower Fraser Valley of British Columbia. Six practices were selected as the basis for studying differences among 100 randomly selected respondents. Adoption performance was examined in relation to socio-economic characteristics and ethnicity.

SOCIO-ECONOMIC CHARACTERISTICS

The median age category for the sample was 45 to 54 years. Age correlated negatively with adoption and 80 per cent of the respondents in the 20 to 34 age group compared to 41.6 per cent of the respondents 55 years of more were in the upper adoption categories. Older respondents had larger families, with approximately one-third in the median category of 3 to 4 children.

Slightly more than half of the respondents had 8 years or less of formal schooling and 42 per cent attended High School but only 11 per cent completed. Twice as many respondents with 8 or less years of schooling (17 per cent) compared to those with more than 8 years (6.5 per cent) were in the laggard category. On the other hand, 74 per cent of the respondents with more than 8 years of schooling were in the higher adoption categories compared to 47.2 per cent of the less educated respondents. Partial correlation analysis did not indicate a significant relationship between educational level and adoption score.

Respondents' wives were generally better educated than their husbands with the median educational level being 9 to 11 years. Education of the wife correlated positively with adoption at the .05 level of significance and 75 per cent of the respondents with better educated wives were in the upper adopter categories compared to 47.2 per cent with less well educated spouses.

Only one-half of the respondents attended agricultural adult education courses and these individuals were generally classified in the early adopter-innovator and early majority categories. Attendance at short courses involved 41 per cent in 1966 and less in 1967. In each instance, attendance was related to adoption positively but the relationship was significant only for attendance in 1967. No more than 10 per cent attended short courses in Washington State in any one year.

The majority of growers were long established on their farms with 65 per cent resident on the present farm for at least 10 years. The older residents were generally the more experienced farmers and also more experienced strawberry growers. Two-thirds of the respondents were in agriculture for 20 years or more with only 28 per cent having a similar experience with the strawberry crop. Adoption score was not significantly related to experience of either kind.

Fifty-four per cent of the growers had holdings of 15 acres or less and 17 per cent reported less than 5 acres while one-fifth managed holdings of at least 120 acres. Small fruit farming was the major enterprise for the large majority of growers while some also reported vegetables, dairying or poultry.

Those operators with the largest farms also had the largest acreage in strawberries as well as in other agricultural enterprises. Strawberry cultivation was the major operation of 41 per cent of the growers but one-half of all respondents had less than 5 acres of this crop.

The median category for gross agricultural income was $5,000 to $10,000 with 45 per cent reporting more than $10,000, 15 per cent more than $55,000, and 18 per cent under $3,000. The predominance of small acreages in strawberries resulted in a lower median income category of $3,000 to $5,000 from strawberry sales. Twenty growers reported no income from agricultural enterprises other than strawberries. The median category of income from strawberries was $5,000 to $10,000 with 21 per cent reporting under $3,000 and 10 per cent more than $40,000.

There was a wide range in the amount of labour employed for harvesting. More than half the operators (53 per cent) employed less than 25 pickers while growers with 50 or more acres in strawberries employed from 200 to 600 pickers.

More than two-thirds (72 per cent) of the respondents were equally distributed in the estimated farm value categories of $10,000 to $29,000 and $30,000 to $59,000. Fourteen valued their farms at more than $150,000. The large operators who were long established also owned the most highly valued farms.

The level of social participation was generally low with 42 per cent obtaining a score of 14 or less and 25 per cent having a score of less than 5. The educational levels of both respondents and their wives were positively and significantly related to the level of social participation. Voluntary participation in organizations as well as in adult education courses was generally higher among the longer established growers in the community. Social participation scores were highest among the operators of larger farms with large incomes. Active participants were relatively younger, better educated, with better educated wives and they generally had higher levels of practice adoption.

Certain socio-economic variables including extent of the business operation--both size of farm and acreage in strawberries, estimated farm value, gross agricultural income and gross income from the specific enterprise related to the innovations--all correlated positively and significantly with adoption indicating that those with higher status in agriculture were more apt to adopt innovations.

The relationship of gross agricultural income to adoption was most marked between growers reporting either more or less than $5,000 income. Combined percentages for lower adopter categories decreased with increasing income, while those for upper adopter categories increased with increasing income. A similar but much more outstanding relationship was found for gross income from strawberries. Combined percentages at the lower adoption level decreased from 64.1 per cent in the lowest income group to 8 per cent for respondents reporting more than $5,000. At the upper adoption level, percentages increased from 35.9 to 92 per cent. Likewise, the significant positive relationship with farm value was illustrated by an increasing combined percentage for upper adopter categories as farm value increased.

Sixty per cent of the respondents reported no off-farm employment, while 16 per cent were employed full time in off-farm occupations, but there was no clear or consistent relationship with adoption score. Eighty operators owned their farms and most of the remaining individuals reported more than half ownership.

ETHNIC INFLUENCES

Fifty-four per cent of the respondents were immigrants. Within the sample of 100 respondents, there were 32 Menonites and 23 Japanese. There were statistically significant differences between ethnic groups for sixteen of the socio-economic variables studied. Japanese respondents owned their farms to a greater extent than was found among all other growers and while they were generally the most experienced farmers, they showed the lowest level of practice adoption and participated least in agricultural adult education activities.

The educational levels of Menonites and their wives were the lowest among all ethnic groups and they were the least active in social participation.

The "other" respondents had the larger, higher valued farms with larger acreages in strawberry and in other agricultural enterprises. Within the 3 to 15 acre category, however, a large proportion of Japanese respondents reported having other agricultural enterprises. Extension contacts were higher among the other respondents and lowest among Japanese; the difference was particularly notable for personal type contacts such as those by telephone and farm visits. Almost twice the percentage of respondents who were neither Japanese nor Menonite were in the upper adoption level compared to Japanese respondents. Menonites showed a higher level of practice adoption compared to Japanese, but were not as high as the "other" group. Except for the fact that twice the proportion of Menonites compared to any other group reported contact by radio, the general relationship remained the same for impersonal contact types.

ADOPTION AND NON-ADOPTION OF THE INNOVATIONS

The level of adoption performance was quite high, with an average of 4.12 out of 6 innovations being adopted. Discontinuance was negligible, involving only a single respondent for each of two practices. Unawareness was recorded for 3 innovations, with a maximum of 8 per cent in any one instance. The awareness stage was only relevant to 3 innovations with a maximum of 5 per cent. The interest and evaluation stages were relevant to 5 of the 6 innovations but involved less than one-third of the respondents in any instance. Some respondents were at the trial stage for all innovations with a maximum of 14 per cent. Adoption ranged between 33 to 94 per cent for all adopter categories with the early adopter-innovators indicating 100 per cent adoption for all innovations.

Generally the percentage of respondents at each stage in the adoption process decreased with improved adoption performance. Five of the 6 innovations were adopted by at least one-half of the respondents. Adoption was highest for those innovations introduced earliest to the growers such as the change in the cultural system (83 per cent) and certified virus-free plants (94 per cent). The classification of progress towards adoption by innovation response state showed that in terms of both unawareness and rejection, the percentage of respondents by adopter category decreased from the lowest to the highest adopter category. The reverse situation occurred for adoption, but there was no consistency in the trend for continuing with the adoption process. Rejection was lowest for the innovations introduced earliest and for those which were more crucial to the economic production of the crop on a commercial scale such as Captan and chemical weed control. On the other hand, almost one-half of the growers rejected picking carts.

REASONS FOR DELAY IN THE ADOPTION PROCESS AND FOR REJECTION

The reasons given for delay and for rejection were classified either as relating to the characteristics of the innovation--including relative advantage, compatibility, complexity, divisibility and communicability--or as one of a number of general reasons--including factors related to the particular situation of the respondent. Characteristics of the innovation accounted for almost one-half of the reasons for delay and for less than one-third of the reasons for rejection. The percentage frequencies were largest for relative advantage and communicability.

Situational factors were the most frequently reported of the general reasons both for delay in the adoption process and for rejection. To some extent delay is explained by the fact that growers may have ceased operations after one of the many periodic freeze-outs. Too small an acreage to justify added expenditure or to benefit from the relative advantage of a new practice compared to one already in use was also stated frequently. Other situational factors included the unavailability of a particular service, either from a local government agency or from custom operators.

The early adopters listed situational factors more frequently than did operators in the lower adoption levels. The former, therefore, were less likely to indicate that they were unable to perceive the relative advantage of an innovation or that there was a problem in recognizing profitable results. On the other hand, being the first to try new innovations, they were most likely to explain some measure of delay due to the need for more information or the fear of crop damage.

There was a more even distribution of reasons for rejection classified as relative advantage or communicability. Cost, and fear or evidence of crop damage, accounted for a slightly larger percentage of the general reasons. Some growers were particularly skeptical about the use of chemicals in agricultural production, hence compatibility accounted for one-third of the reasons relevant to chemical weed control. The particular problem involved in respondents seeing the beneficial effects of Captan in the increased proportion of marketable fruit resulted in 42.9 per cent of the reasons classified as communicability. With a few exceptions, situational factors were generally similar to those given for delay in the adoption process.

CONCLUSIONS

In spite of the high rate of adoption for the innovations studied, the data suggest a number of matters for consideration with respect to the diffusion of innovations.

The pronounced differences among the three ethnic groups indicate that different approaches to each group must be followed. Language differences undoubtedly impede communication but the customary media used by agricultural extension personnel must be modified for the different groups in order to provide equal access to information and assistance at crucial points in the adoption process.

At the time an innovation is presented to the farmer it must be accompanied by all the information essential to make an intelligent decision about it. Furthermore, the introduction must be accompanied by efforts to ensure that farmers comprehend the changes or adjustments in allied practices which may be vital to success in the total farm management operation.

Innovations that are closely related or interdependent should be introduced as a package rather than as separate entities. This was illustrated by matted row culture and Captan for fruit rot control in that the success of the former depends to some extent upon the use of the latter innovation.

Successful prior experience with a similar innovation or with the same type of innovation in a different context will facilitate the acceptance of a new practice. Thus, the innovation to be introduced should be related to the previous experience of the farmer so that that experience can be transferred to the new innovation.

Both delay in proceeding through the adoption process and rejection of an innovation are influenced by a continuing flow of information and support from the agricultural extension service as the farmer proceeds through the adoption process. Thus, the farmer must be supplied with information about the innovation as well as assistance in overcoming any obstacles to successful adoption that may arise during the diffusion process.

It is less important that a farmer adopt an innovation *per se* than that he make a decision about an innovation rationally. Thus, the agricultural agent should help the farmer analyze the innovation in the light of his own particular situation so that he can accept or reject on rational grounds. Acceptance of an innovation irrationally will lead to subsequent discontinuance because the innovation has proved less advantageous or economic than the previous practice. Such experience may lead the farmer to reject subsequent innovations to which he is introduced.

All things considered, the ultimate responsibility for the successful diffusion of agricultural technology rests with those who introduce change to the farmer. The way in which they control the diffusion process will determine the ultimate degree of success.

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APPENDIX I

DETAILED DISTRIBUTIONS BY ETHNIC ORIGIN

TABLE XV

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY AGRICULTURAL ADULT EDUCATION

Ethnic Group	Attendance at Agricultural Adult Education Courses		
	Did not attend Courses %	Attended Courses %	Total %
Menonites	50.0	50.0	100.0
Japanese	69.6	30.4	100.0
Others	41.2	58.8	100.0

TABLE XVI

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EDUCATIONAL LEVEL

Ethnic Group	Educational Level			
	8 years or less %	9-11 years %	more than 11 years %	Total %
Menonites	73.1	15.4	11.5	100.0
Japanese	43.5	39.1	17.4	100.0
Others	47.1	35.3	17.6	100.0

TABLE XVII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY VOCATIONAL AGRICULTURAL EDUCATION

Ethnic Group	Vocational agricultural education		
	Received Training %	Did not receive Training %	Total %
Menonite	15.4	84.6	100.0
Japanese	0.0	100.0	100.0
Others	5.9	94.1	100.0

TABLE XVIII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EDUCATIONAL LEVEL OF WIFE

Ethnic Group	Educational level of Wife			
	8 years or less %	9-11 years %	12 years or more %	Total %
Menonites	73.9	13.0	13.1	100.0
Japanese	29.4	23.5	47.1	100.0
Others	40.9	31.8	27.3	100.0

TABLE XIX

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY YEARS OF EXPERIENCE IN STRAWBERRY

Ethnic Group	Years of experience in strawberry			
	9 years or less %	10-19 years %	20 or more years %	Total %
Menonites	30.8	30.8	38.4	100.0
Japanese	13.0	65.2	21.8	100.0
Others	41.2	33.3	25.5	100.0

TABLE XX

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY YEARS ON PRESENT FARM

Ethnic Group	Years on present farm			
	9 years or less %	10-19 years %	20 or more years %	Total %
Menonites	46.2	26.9	26.9	100.0
Japanese	17.4	78.3	4.3	100.0
Others	41.2	25.5	33.3	100.0

TABLE XXI

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY SOCIAL PARTICIPATION

Ethnic Group	Social participation score 4 or less %	5 - 14 %	more than 14 %	Total %
Menonites	38.5	46.2	15.3	100.0
Japanese	21.7	34.8	43.5	100.0
Others	21.6	43.1	35.3	100.0

TABLE XXII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY SIZE OF FARM

Ethnic Group	Size of Farm less than 5 acres %	5 to less than 15 %	15 or more %	Total %
Menonites	23.1	42.3	34.6	100.0
Japanese	21.7	43.5	34.8	100.0
Others	11.8	31.4	56.8	100.0

TABLE XXIII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY ACREAGE IN STRAWBERRY

Ethnic Group	Acreage in strawberry			
	less than 3 acres %	3 to less than 15 %	5 or more %	Total %
Menonites	34.6	19.2	46.2	100.0
Japanese	47.8	30.4	21.8	100.0
Others	25.5	9.8	64.7	100.0

TABLE XXIV

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY ACREAGE IN OTHER AGRICULTURAL ENTERPRISES

Ethnic Group	Acreage in other agricultural enterprises			
	less than 3 acres %	3 to less than 15 %	15 or more %	Total %
Menonites	46.2	30.8	23.0	100.0
Japanese	21.7	65.3	13.0	100.0
Others	21.6	31.4	47.0	100.0

TABLE XXV

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY GROSS TOTAL AGRICULTURAL SALES

Ethnic Group	Gross total agricultural sales			
	$5000 or less %	$5000 to $15000 %	more than $15000 %	Total %
Menonites	57.7	23.1	19.2	100.0
Japanese	26.1	47.8	26.1	100.0
Others	27.5	27.5	45.0	100.0

TABLE XXVI

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY GROSS SALES FROM STRAWBERRY

Ethnic Group	Gross sales from strawberry			
	less than $3000 %	$3000 to $10,000 %	more than $10,000 %	Total %
Menonites	53.8	23.1	23.1	100.0
Japanese	39.1	56.5	4.4	100.0
Others	31.4	33.3	35.3	100.0

TABLE XXVII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY GROSS SALES FROM OTHER AGRICULTURAL ENTERPRISES

Ethnic Group	Gross sales from other agricultural enterprises			
	No sales or less than $3000 %	$3000 to $5000 %	more than $5000 %	Total %
Menonites	50.0	26.9	23.1	100.0
Japanese	8.7	26.1	65.2	100.0
Others	25.5	15.7	58.8	100.0

TABLE XXVIII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY TENURE

Ethnic Group	Tenure		
	Owned the farm %	Did not own the farm %	Total %
Menonites	80.8	19.2	100.0
Japanese	95.7	4.3	100.0
Others	72.6	27.4	100.0

TABLE XXIX

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF OFF-FARM WORK

Ethnic Group	Extent of off-farm work No off-farm work %	 Did off-farm work %	 Total %
Menonites	46.2	53.8	100.0
Japanese	73.9	26.1	100.0
Others	60.8	39.2	100.0

TABLE XXX

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY ESTIMATED FARM VALUE

Ethnic Group	Estimated farm value Less than $30,000 %	 $30,000 to $59,999 %	 $60,000 or more %	 Total %
Menonites	57.7	30.8	11.5	100.0
Japanese	45.5	40.9	13.6	100.0
Others	27.5	37.3	35.3	100.0

TABLE XXXI

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF CONTACT WITH THE DISTRICT HORTICULTURIST THROUGH TELEPHONE

Ethnic Group	Contact with District Horticulturist			
	No Contact %	Seldom or occasionally %	frequently or very frequently %	Total %
Menonite	46.2	23.1	30.7	100.0
Japanese	56.5	26.1	17.4	100.0
Others	23.5	47.1	29.4	100.0

TABLE XXXII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF CONTACT WITH THE DISTRICT HORTICULTURISTS THROUGH FARM VISITS

Ethnic Group	Extent of contact with the District Horticulturist			
	No Contact %	Seldom or occasionally %	frequently or very frequently %	Total %
Menonites	50.0	34.6	15.4	100.0
Japanese	69.6	30.4	0.0	100.0
Others	29.4	54.9	15.7	100.0

TABLE XXXIII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF CONTACT WITH THE DISTRICT HORTICULTURIST THROUGH MAIL

Ethnic Group	Extent of contact through Mail			
	No Contact %	Seldom or occasionally %	frequently or very frequently %	Total %
Menonite	26.9	23.1	50.0	100.0
Japanese	30.4	17.4	52.2	100.0
Others	7.9	23.5	68.6	100.0

TABLE XXXIV

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF CONTACT WITH THE DISTRICT HORTICULTURIST THROUGH RADIO

Ethnic Group	Extent of contact through radio		
	No contact %	Contact by radio %	Total %
Menonite	57.7	42.3	100.0
Japanese	87.0	13.0	100.0
Others	74.5	25.5	100.0

TABLE XXXV

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY EXTENT OF CONTACT WITH THE DISTRICT HORTICULTURIST THROUGH NEWSPAPER ARTICLES

Ethnic Group	No Contact %	Seldom or occasionally %	frequently or very frequently %	Total %
Menonites	46.2	42.3	11.5	100.0
Japanese	47.8	21.7	30.5	100.0
Others	25.5	51.0	23.5	100.0

TABLE XXXVI

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY ATTENDANCE AT L.M.H.I.A. SHORT COURSE (1966)

	Attendance at L.M.H.I.A. Short Course		
Ethnic Group	Did not attend %	Did attend %	Total %
Menonite	69.2	30.8	100.0
Japanese	82.6	17.4	100.0
Others	43.1	56.9	100.0

TABLE XXXVII

PERCENTAGE DISTRIBUTION OF ETHNIC GROUP BY ATTENDANCE AT L.M.H.I.A. SHORT COURSE (1967)

Ethnic Group	Attendance at L.M.H.I.A. Short Course		
	Did not attend %	Did attend %	Total %
Menonite	73.1	26.9	100.0
Japanese	95.7	4.3	100.0
Others	58.9	41.1	100.0

APPENDIX II

DETAILED ANALYSIS OF THE INNOVATION RESPONSE STATES

TABLE XXXVIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS UNAWARE OF THE INNOVATION, BY ADOPTER CATEGORY AND BY INNOVATION

Innovation	Adopter Category			
	Laggard %	Late Majority %	Early Majority %	Early Adopter-Innovator %
Soil analysis for nematode control	58.3	3.6	0.0	0.0
Spraying with Captan for fruit-rot control	8.3	0.0	0.0	0.0
Change from hill to matted row	0.0	0.0	0.0	0.0
Chemical weed control	0.0	0.0	0.0	0.0
Use of picking carts	41.7	0.0	0.0	0.0
Use of virus-free certified plants	0.0	0.0	0.0	0.0
Average	18.0	0.6	0.0	0.0

TABLE XXXIX

PERCENTAGE DISTRIBUTION OF RESPONDENTS CONTINUING THE ADOPTION PROCESS, BY ADOPTER CATEGORY AND BY INNOVATION

Innovation	Adopter Category			
	Laggard %	Late Majority %	Early Majority %	Early Adopter-Innovator %
Soil analysis for nematode control	16.7	46.4	25.6	0.0
Spraying with Captan for fruit-rot control	25.0	28.6	9.3	0.0
Change from hill to matted row	25.0	17.9	4.6	0.0
Chemical weed control	50.0	17.9	2.3	0.0
Use of picking carts	8.3	25.0	27.9	0.0
Use of virus-free certified plants	8.3	7.1	4.6	0.0
Average	22.2	23.8	12.4	0.0

TABLE XL

PERCENTAGE DISTRIBUTION OF RESPONDENTS WHO HAD ADOPTED THE INNOVATION, BY ADOPTER CATEGORY AND BY INNOVATION

Innovation	Laggard %	Late Majority %	Early Majority %	Early Adopter-Innovator %
Soil analysis for nematode control	8.3	17.9	62.8	100.0
Spraying with Captan for fruit-rot control	33.3	60.7	88.4	100.0
Change from hill to matted row	41.7	71.4*	95.4	100.0
Chemical weed control	16.7	57.1*	95.4	100.0
Use of picking carts	0.0	17.9	25.6	100.0
Use of virus-free certified plants	83.3	92.9	95.4	100.0
Average	30.6	53.0	77.2	100.0

* 1 respondent (3.6 per cent) accounted for by Discontinuance

TABLE XLI

PERCENTAGE DISTRIBUTION OF RESPONDENTS WHO HAD REJECTED THE INNOVATION, BY ADOPTER CATEGORY AND BY INNOVATION

Innovation	Laggard %	Late Majority %	Early Majority %	Early Adopter-Innovator %
Soil analysis for nematode control	16.7	35.7	11.6	0.0
Spraying with Captan for fruit-rot control	33.3	10.7	2.3	0.0
Change from hill to matted row	33.3	3.6	0.0	0.0
Chemical weed control	33.3	21.4	2.3	0.0
Use of picking carts	50.0	57.1	46.5	0.0
Use of virus-free certified plants	8.3	0.0	0.0	0.0
Average	29.2	21.4	10.5	0.0

APPENDIX III

DETAILED DISTRIBUTIONS BY ADOPTER CATEGORY

TABLE XLII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY AGE GROUP

Adopter Category	20-34 Years %	35-54 Years %	55 or more years %	Number of Respondents
Laggard	10.0	5.6	22.2	12
Late majority	10.0	25.9	36.2	28
Early majority	70.0	44.4	33.3	43
Early adopter-innovator	10.0	24.1	8.3	17
Total	100.0	100.0	100.0	100

TABLE XLIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY SIZE OF FAMILY

Adopter category	0 - 2 children %	3 or more children %	Number of Respondents
Laggard	13.2	11.3	12
Late majority	23.7	30.6	28
Early majority	57.8	33.9	43
Early adopter-innovator	5.3	24.2	17
Total	100.0	100.0	100

TABLE XLIV

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY LEVEL OF EDUCATION

Adopter Category	8 years or less %	more than 8 years %	Number of Respondents
Laggard	17.0	5.5	12
Late majority	35.8	19.4	28
Early majority	26.4	58.1	43
Early adopter-innovator	20.8	16.0	17
Total	100.0	100.0	100

TABLE XLV

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY EDUCATIONAL LEVEL OF WIFE

Adopter Category	8 years or less %	more than 8 years %	Number of Respondents
Laggard	15.0	6.8	9
Late majority	37.5	18.2	23
Early majority	32.5	50.0	35
Early adopter-innovator	15.0	25.0	17
Total	100.0	100.0	84

TABLE XLVI

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY AGRICULTURE COURSES IN HIGH SCHOOL

Adopter Category	Took Courses %	Did not take Courses %	Number of Respondents
Laggard	0.0	12.8	12
Late majority	20.0	27.7	27
Early majority	80.0	41.5	43
Early adopter-innovator	0.0	18.0	17
Total	100.0	100.0	99

TABLE XLVII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY AGRICULTURE COURSES AT VOCATIONAL SCHOOL

Adopter Category	Took Courses %	Did not take Courses %	Number of Respondents
Laggard	0.0	12.9	12
Late majority	28.6	28.0	28
Early majority	28.6	44.1	43
Early adopter-innovator	42.8	15.0	17
Total	100.0	100.0	100

TABLE XLVIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY NUMBER OF YEARS OF FARMING EXPERIENCE

Adopter Category	9 or less years %	10 - 19 years %	20 or more years %	Number of Respondents
Laggards	15.4	9.5	12.1	12
Late majority	15.4	28.6	30.3	28
Early majority	69.2	42.9	37.9	43
Early adopter-innovator	0.0	19.0	19.7	17
Total	100.0	100.0	100.0	100

TABLE XLIX

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY NUMBER OF YEARS IN STRAWBERRY

Adopter Category	Less than 5 years %	5 - 9 years %	10 - 19 years %	20 or more years %	Number of Respondents
Laggard	5.9	6.7	15.0	14.3	12
Late majority	35.3	6.7	35.0	25.0	28
Early majority	52.9	60.0	37.5	35.7	43
Early adopter-innovator	5.9	26.6	12.5	25.0	17
Total	100.0	100.0	100.0	100.0	100

TABLE L

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY NUMBER OF YEARS ON PRESENT FARM

Adopter Category	4 years or less %	5 - 9 years %	10 - 19 years %	20 or more years %	Number of Respondents
Laggard	12.5	6.9	21.1	4.0	12
Late majority	37.5	20.7	31.6	28.0	28
Early majority	25.0	44.8	39.5	52.0	42
Early adopter-innovator	25.0	27.6	7.9	16.0	17
Total	100.0	100.0	100.0	100.0	100

TABLE LI

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY ETHNIC ORIGIN

Adopter Category	Number of Menonites %	Number of Japanese %	Number of "others" %	Number of Respondents
Laggard	11.5	17.4	9.8	12
Late majority	34.6	43.5	17.7	28
Early majority	30.8	34.8	52.9	43
Early adopter-innovator	23.1	4.3	19.6	17
Total	100.0	100.0	100.0	100

TABLE LII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY SOCIAL PARTICIPATION

Adopter Category	Nil %	1 - 14 %	15 - 24 %	more than 24 %	Number of Respondents
Laggard	37.5	9.8	0.0	5.9	12
Late majority	47.7	31.4	26.7	11.8	28
Early majority	22.7	39.2	53.3	64.7	42
Early adopter-innovator	4.6	19.6	20.0	17.6	17
Total	100.0	100.0	100.0	100.0	99

TABLE LIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY SIZE OF FARM

Adopter Category	0 - 4 acres %	5 - 29 acres %	30-119 acres %	more than 119 acres %	Number of Respondents
Laggard	35.3	8.5	7.7	0.0	12
Late majority	35.3	30.5	23.1	9.1	28
Early majority	17.6	45.8	46.2	63.6	43
Early adopter-innovator	11.8	15.2	23.0	27.3	17
Total	100.0	100.0	100.0	100.0	100

TABLE LIV

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY ACREAGE IN STRAWBERRY

Adopter Category	Less than 3 acres %	3 - 29 acres %	30 or more acres %	Number of Respondents
Laggard	27.3	6.2	0.0	12
Late majority	42.4	25.0	10.5	28
Early majority	24.2	48.0	63.2	43
Early adopter-innovator	6.1	20.8	26.3	17
Total	100.0	100.0	100.0	100

TABLE LV

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY ACREAGE IN OTHER AGRICULTURAL ENTERPRISES

Adopter Category	0 - 2 acres %	3 - 14 acres %	15 or more acres %	Number of Respondents
Laggard	21.4	10.3	6.1	12
Late majority	17.8	41.0	21.2	28
Early majority	35.8	35.9	57.6	43
Early adopter-innovator	25.0	12.8	15.0	17
Total	100.0	100.0	100.0	100

TABLE LVI

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY GROSS TOTAL SALES FROM AGRICULTURE

Adopter Category	Nil to less than $5000 %	$5000 to $25,000 %	more than $25,000 %	Number of Respondents
Laggard	28.6	2.4	4.3	12
Late majority	40.0	23.8	17.5	28
Early majority	22.8	57.1	47.8	43
Early adopter-innovator	8.6	16.7	30.4	17
Total	100.0	100.0	100.0	100

TABLE LVII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY GROSS SALES FROM STRAWBERRY

Adopter Category	Nil to less than $3000 %	$3000 to $5000 %	More than $5000 %	Number of Respondents
Laggard	25.6	5.6	0.0	12
Late majority	38.5	30.6	8.0	28
Early majority	28.2	44.4	64.0	43
Early adopter-innovator	7.7	19.4	28.0	17
Total	100.0	100.0	100.0	100

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TABLE LVIII

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY GROSS SALES FROM OTHER AGRICULTURAL ENTERPRISES

Adopter Category	Nil to less than $3000 %	$3000 to $15,000 %	More than $15,000 %	Number of Respondents
Laggard	18.4	6.9	4.5	12
Late majority	28.6	34.5	18.2	28
Early majority	34.7	51.7	50.0	43
Early adopter-innovator	18.3	6.9	27.3	17
Total	100.0	100.0	100.0	100

TABLE LIX

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY AMOUNT OF TIME SPENT IN OFF-FARM WORK

Adopter Category	Nil %	Less than one-quarter to less than one-half %	One-half or more %	Number of Respondents
Laggard	16.7	0.0	7.2	12
Late majority	21.7	50.0	32.1	28
Early majority	51.6	25.0	32.1	43
Early adopter-innovator	10.0	25.0	28.6	17
Total	100.0	100.0	100.0	100

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TABLE LX

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY ADOPTER CATEGORY AND BY ESTIMATED FARM VALUE

Adopter Category	Less than $30,000 %	$30,000 to less than $90,000 %	$90,000 or more %	Number of Respondents
Laggard	17.9	7.3	5.3	11
Late majority	41.1	22.0	15.8	28
Early majority	33.3	48.7	52.6	43
Early adopter-innovator	7.7	22.0	26.3	17
Total	100.0	100.0	100.0	99